DOCUMENT 368-83

TAQUAC, GUAM ISLAND

RANGE REFERENCE ATMOSPHERE
0-30 KM ALTITUDE

SEPTEMBER 1983

METEOROLOGY GROUP
RANGE COMMANDERS COUNCIL

WHITE SANDS MISSILE RANGE
KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND

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DOCUMENT 368-83

TAQUAC, GUAM ISLAND

RANGE REFERENCE ATMOSPHERE
0-30 KM ALTITUDE

September 1983

Prepared by

Range Reference Atmosphere Committee
Meteorology Group
Range Commanders Council

Published by

Secretariat
Range Commanders Council
White Sands Missile Range, New Mexico 88002

TABLE OF CONTENTS

LIST OF ORGANIZATION ACRONYMS

AD	Armament Division
AFFTC	Air Force Flight Test Center
AFSC	Air Force Systems Command
AFSC/AFGL	AFSC/Air Force Geophysics Laboratory
AFSC/SD	AFSC/Space Division
AFSCF	Air Force Satellite Control Facility
AFTFWC	Air Force Tactical Fighter Weapons Center
AWS	Air Weather Service
BMD	Ballistic Missile Division
DOD	Department of Defense
DOE	Department of Energy
DOE/NTS	DOE/Nevada Test Site
DPG	Dugway Proving Ground
ESMC	Eastern Space and Missile Center
ETR	Eastern Test Range
KMR	Kwajalein Missile Range
NASA	National Aeronautics and Space Administration
NASA/MSFC	NASA/Marshall Space Flight Center
NASA/WFC	NASA/Wallops Flight Center
NOAA	National Oceanic and Atmospheric Administration
NWC	Naval Weapons Center
PMTC	Pacific Missile Test Center
USA/DTC	U.S. Army/Deseret Test Center
USAECOM	U.S. Army Electronics Command
USAFETAC	United States Air Force Environmental Technical Applications Center

UTTR	Utah Test and Training Range
WSMC	Western Space and Missile Center
WSMR	White Sands Missile Range
WTR	Western Test Range
YPG	Yuma Proving Ground
6585TG	6585th Test Group
TSCF	Targeting Systems Characterization Facility

FOREWORD

Atmospheric parameters are essential to the research and development of missiles and aerospace vehicles. In the early 1960's, the need was recognized for realistic atmospheric models derived in a consistent manner for each of the several major test ranges. An atmospheric model derived from statistical data for a particular geographical location is referred to as a reference atmosphere.

The first Range Reference Atmosphere (RRA) was issued in 1963 by the Inter-Range Instrumentation Group (IRIG) for Cape Kennedy, Florida, and was followed by additional publications for several ranges up to 1974. Since that time, improved upper air data bases have become available from which to develop the RRA. These resulted from the extended period of records and from improvement in the upper air measuring program by rocketsondes for altitudes above the rawinsonde ceiling of 30 km. Revised and improved RRAs are justified for the following reasons:

1) Needs for more definitive statistical atmospheric models have arisen because of changes and advances in aerospace technology. The Space Transportation System (Space Shuttle) is one example.

2) Most ranges now have an extended and improved upper air data base from which to develop a more definitive RRA.

3) There are requirements for RRAs for new ranges and range sites.

4) There have been scientific advances in understanding the upper atmospheric structure and physical relationships.

5) Advances in statistical modeling techniques have been made because of the general availability of high-speed electronic computers. These have led to the adoption of advanced concepts in atmospheric modeling.

For these reasons, the Range Reference Atmosphere Committee (RRAC) was tasked by the Range Commanders Council Meteorology Group (RCC MG) to establish new and improved RRAs. The purpose, scope, and objectives of this task are outlined in the following paragraphs.

Purpose: This committee, Task MG-1, establishes RRAs for the several ranges as provided by the RCC. An RRA is a model of the Earth's atmosphere over a geographical location of interest, for use by DOD and other U.S. Government range users. The RRA is used to provide planning data for evaluating environmental constraints for the particular configurations of environment-sensitive systems and components being developed or undergoing tests.

Scope: Using the best available upper atmosphere data base to include rawinsonde, rocketsonde and possibly other high-altitude data sources for the range location, the task is to establish a model of certain statistics for wind and thermodynamic quantities derived in a uniform manner and published in a standardized format.

Objectives: The wind statistics shall be, insofar as practical, modeled to be consistent with rigorous mathematical probability properties of the multivariate normal probability theory. The thermodynamic quantities statistics shall be, insofar as practical, modeled to be consistent with the hydrostatic equation, the equation of state, and the probability principles that are related through these physical equations. The document shall serve as an authoritative source of information and as an atmospheric model for a particular range. The first in the series of revised RRAs to be published is for Kwajalein Missile Range (KMR) (publication date December 1982). The altitude range required for KMR is 0 to 70 km. The order of priority for the subsequent publications is:

	Range	Altitude Range Required
1.	AFFTC/Edwards AFB, CA	0 - 70 km[a]
2.	ESMC/Cape Canaveral AFS, FL	0 - 70 km
3.	WSMC/Vandenberg AFB, CA	0 - 70 km[a]
4.	WSMR/White Sands, NM	0 - 70 km
5.	PMTC/Point Mugu, CA	0 - 70 km
6.	UTTR/Dugway (Michael AAF), UT	0 - 30 km[b]
7.	AD/Eglin AFB, FL	0 - 30 km
8.	ESMC/Ascension Island	0 - 70 km (Terminates at 66 km because of insufficient data)
9.	NASA/Wallops Flight Center, VA	0 - 70 km
10.	Taquac (Guam)	0 - 30 km
11.	PMTC/Barking Sands, HI	0 - 70 km

In keeping with the RCC's objective of standardization, the modeling techniques, basic text, and tabulation format are to be the same for all RRAs. These new and revised RRAs present not only the mean values of the thermodynamic quantities (pressure, temperature, virtual temperature, and density), but also include statistical measures for the dispersion (i.e., standard deviations and skewness coefficients). New quantities presented are water vapor pressure and dewpoint temperature. The statistical modeling for the wind is entirely new. The new approach uses the properties of the bivariate normal probability distribution function.

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a. Use rocketsonde data from PMTC/Point Mugu for altitudes above 30 km.
b. Consider augmenting data base from Ely or Salt Lake City.

All final computations were performed by the United States Air Force Environmental Technical Applications Center (USAFETAC) in response to a task from Eastern Space and Missile Center (ESMC).

The text was prepared jointly by USAFETAC and the NASA/George C. Marshall Space Flight Center's Space Sciences Laboratory, Atmospheric Sciences Division. The editing and preparation of the draft manuscript were performed by the NASA/MSFC organization.

The cochairmen express their gratitude to all RRAC members and their respective colleagues who have made significant technical contributions to the establishment of these RRAs.

Special thanks are tendered to Lt. B. Novograd for his dilligence in forming the many computations and the development of the primary tables, I through IV. Special thanks goes to Lt. F. Wirsing for editing and formulating the equations for the derivable thermodynamic equations. These gentlemen performed this outstanding work under the direction of Major B. Lilius, USAFETAC.

Grateful acknowledgment goes to Mrs. Annette Tingle, NASA/MSFC, for editing the draft manuscript.

The RRAC consists of representatives from the U.S. Air Force, U.S. Army, National Aeronautics and Space Administration, U.S. Navy, and National Oceanic and Atmospheric Administration. The committee members for the RRA for the first publication are:

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O. H. Daniel, ESMC
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CHAPTER I. INTRODUCTION

A. Definition and Purpose of the Range Reference Atmosphere

A.1 Definition

A reference atmosphere is a statistical model of the Earth's atmosphere derived from upper air measurements over a particular geographical location. Hence, these Range Reference Atmospheres (RRAs) are atmospheric models developed by the Range Reference Atmosphere Committee (RRAC) in response to a task by the Range Commanders Council Meteorology Group (RCC MG) and published by the RCC Secretariat. The RCC MG, formerly called the Inter-Range Instrumentation Group/Meteorology Working Group (IRIG/MWG), published a series of RRAs during the period 1963 through 1974.

A.2 Purpose

A series of revised and expanded RRAs are to be published for locations of interest to the RCC. These publications are to serve as authoritative reference sources on certain upper air statistics and as atmospheric models for particular range sites. The technical usefulness of these documents for the ranges, range users, U.S. aerospace industries, and the scientific community is recognized because of the standardization of the development techniques and the presentation of the tabulations.

B. Scope of the Range Reference Atmosphere and Arrangement of Tables

B.1 Scope

The RRA contains tabulations for monthly and annual means, standard deviations, and skewness coefficients for windspeed, pressure, temperature, density, water vapor pressure, virtual temperature, and dewpoint temperature; the means and standard deviations for the zonal (U) and meridional (V) wind components; and the linear (product moment) correlation coefficient between the wind components. These statistical parameters are tabulated at the station elevation, at 1-km intervals from sea level to 30 km, and at 2-km intervals from 30 to 90 km. The wind statistics are given at approximately 10 m above the station elevations and at altitudes with respect to mean sea level thereafter. For those range sites without rocketsonde measurements, the RRAs terminate at 30 km altitude, or they are extended, if required, when rocketsonde data from a nearby launch site are available. There are four sets of tables for each of the 12 monthly reference periods and the annual reference period.

B.2 Arrangement of Tables

The statistical parameters for the RRA models are presented in four tables, as outlined in the following paragraphs.

Table I contains all the wind statistical parameters. This table gives the monthly and annual means and standard deviations of the U and V wind components and the linear (product moment) correlation coefficient between these

two components; the mean, standard deviation and skewness coefficient of the windspeed; and the number of wind observations (sample size).

Table II contains the monthly and annual means, standard deviations, and skewness values of pressure, temperature, and density, and the number of observations used for each of these thermodynamic quantities.

Table III contains the monthly and annual means, standard deviations and skewness values of the water vapor pressure, virtual temperature and dewpoint, and the number of observations for each of these moisture-related quantities. The statistical parameters for water vapor pressure and dewpoint terminate at 15 km altitude. Above 15 km the statistical parameters for virtual temperature are considered to be the same as those for temperature.

Table IV contains the monthly and annual mean atmospheric models for the thermodynamic variables: pressure, virtual temperature, and density. This table is derived from the monthly and annual mean virtual temperature versus altitude (geometric) using the hydrostatic equation and the equation of state. Also presented is the geopotential height corresponding to the tabulated geometric altitudes.

The physical unit for all wind parameters is meters per second. The physical unit for pressure is millibars; for temperature and virtual temperature, degrees Kelvin; for density, grams per cubic meter; and for water vapor pressure, millibars. In all cases the skewness coefficient and the correlation coefficient between wind components are unitless. All reference to altitude is geometric altitude and is expressed in kilometers. All reference to height is geopotential height and has the unit geopotential meters or kilometers. All geometric altitudes and geopotential heights are with respect to mean sea level.

C. Data Quality Control Procedures

A small portion (less than 10 percent) of the soundings in the data base used to calculate the RRA tables contained erroneous data values. The soundings which contained these erroneous values were eliminated from the data base using the following procedures:

1) Soundings containing gaps in their height data greater than 200 mb were rejected. This step was taken because some soundings only contained height values at their "mandatory" pressure levels, which were occasionally missing, resulting in soundings with no height information at all.

2) An initial set of RRA statistics was computed using all the remaining soundings. This initial set of statistics was used to determine data limits for the temperature, pressure, U and V components of the wind, and the dewpoint (for the 0- to 30-km portion of the RRA) or the density (for the 30- to 90-km portion of the RRA). The lower (upper) data limits were set at the mean value for a specific parameter, minus (plus) six standard deviations of that quantity. One pair of data limits was computed for each of these parameters: month of the year and data level.

3) This initial set of data limits was then used to screen the data base. All the soundings that contained values outside these data limits were rejected. A new RRA was then computed using the screened data base. This second RRA was used to generate a second set of data limits.

4) The second set of data limits was then used to screen the data base further. A new RRA was again generated. The skewness values in this RRA were then evaluated, according to empirical criteria specified in section II.A.3 of this document for the winds, and according to criteria in section III.A.3 for the thermodynamic quantities. If these criteria were satisfied, the new RRA was then used to generate a final set of data limits, which were used to control the quality of the data base for the final version of the RRA.

5) Occasionally, the third RRA that was generated did not satisfy all of the skewness criteria. This indicated that some incorrect values were still present in the data base. To complete quality control, steps 3 and 4 were repeated for additional iterations (usually one or two) until the resulting RRA satisfied the skewness criteria. At that point, a final set of data limits was generated. This final set of data limits was then used to control the quality of the data base and generate the final RRA.

D. Organization of the Chapters

Because there are plans to publish a series of RRAs, comments on the special organization of the document are in order. The RRA document is arranged in four chapters. Chapter I is the introduction. Chapter II, Wind Statistics and Models, contains the techniques used to arrive at the wind statistical parameters, table I, and the probability functions that are to be used as wind models to derive several wind statistics. Chapter III, Statistics of Thermodynamic Quantities and Models, contains the techniques used to arrive at the thermodynamic and moisture-related statistical parameters given in tables II and III and the atmospheric thermodynamic model presented in table IV. This chapter also contains sets of equations to calculate several atmospheric properties. Chapter IV contains the general conclusions and recommendations. These four chapters are reprinted without change for each documented RRA to assure consistency and for expediency in preparing the documentation. To account for variations particular to a specific RRA, two appendixes have been included. Appendix A, Examples of Wind Statistics, is designed to give a few illustrative examples of wind statistics for the specific RRA and cursory observations, comparisons, or comments on wind statistics. Appendix B, Range Specific Information, is designed to present specific information particular to the range, such as geographical location, data base, etc., and any cursory observations or comments on the thermodynamic quantities.

Read these appendixes! They are located as the last two units in the document because they may vary in length depending on the circumstances. Appendixes A and B and tables I, II, III, and IV are the only differences among the RRA documents published in this new RRA series.

CHAPTER II. WIND STATISTICS AND MODELS

A. General Considerations

A.1. Objectives

An objective of the RRA is to furnish minimum tabulation for the wind statistics. To meet this objective, the bivariate normal probability distribution was adopted as a statistical model for the wind treated as a vector quantity at the RRA data levels. Only five statistical parameters are required to completely describe this probability function. In Cartesian coordinates these parameters are the means and standard deviations of the two orthogonal components and the correlation coefficient between the two components. These five statistical parameters for the U and V (meteorological coordinates) components are given in table I. The statistical properties of the bivariate normal probability distribution are used to derive many wind statistics that are of interest to the ranges and range users. This procedure produces consistent wind statistics that are connected through rigorous mathematical probability functions. By using these functions, extensive tabulations of wind statistics are avoided.

The statistical properties of the bivariate normal probability distribution presented for the vector wind statistical model are:

1) The wind components are univariate normally distributed.

2) The conditional distribution of one component given a value of the other component is univariate normally distributed.

3) The windspeed is of the form of a generalized Rayleigh distribution.

4) The frequency distribution of wind direction can be derived.

5) The conditional distribution of windspeed given a value of wind direction (wind rose) can be derived.

6) The five tabulated wind statistical parameters with respect to the meteorological U and V coordinate system can be derived for any arbitrary rotation of the orthogonal axes.

The probability distribution functions and sets of equations to derive wind statistics for the previously stated properties of the vector wind model are presented in this chapter. Symbols used are summarized in table A. Illustrative examples are presented in appendix A. No attempt is made to give the derivation of the probability functions. The reader is referred to Smith (1976) for some derivations and several applications of the probability distribution properties for wind statistics.

A.2. Data Quality Control

The U and V components of the wind were used to generate data limits set at plus and minus six standard deviations from the mean for each of the

TABLE A. LIST OF SYMBOLS USED IN CHAPTER II

N - The number of wind measurements in table I

r - A general variable for the bivariate normal probability distribution in polar coordinates

R - A generalized Rayleigh variable used for derived windspeed probability distribution

R (U, V) - The linear (product moment) correlation coefficient between the zonal and meridional wind components in table I

SK (W) - Skewness parameter for windspeed in table I

S (U) - The standard deviation of the zonal wind component in table I

S (V) - The standard deviation of the meridional wind component in table I

S (W) - The standard deviation of windspeed in table I

t - A standardized normal variate used in text table B

U - The zonal wind component

UBAR - The mean value of the zonal wind component in table I

V - The meridional wind component

VBAR - The mean value of the meridional wind component in table I

W - Windspeed or modulus of wind vector, a scalar quantity

WBAR - The mean value of windspeed in table I

X - A general component variable or coordinate axis

Y - A general component variable or coordinate axis

$\bar{X}$ - A general component mean value in the [x,y] coordinate system

$\bar{Y}$ - A general component mean value in the [x,y] coordinate system

α (alpha) - Rotation angle for the [x,y] coordinate system

TABLE A. (concluded)

θ (theta) - Wind direction in the polar coordinate system

$\lambda_{(\ )}$ (Lambda) - A parameter in the bivariate normal probability distribution in text table C

ξ (Xi) - The mean value in the standardized normal probability distribution used in text table B

π (Pi) - Constant = 3.14159 ...

ρ (Rho) - The general linear correlation coefficient between the two component variables in the [x,y] coordinate system

σ_x, σ_y - The general standard deviations of the x and y component variables in the [x,y] coordinate system.

quantities. These data limits were used to screen the wind data base, as described in section I.C. The data base was considered to be free from errors under the following conditions:

1) The skewness of the windspeed was below 4.0 at data levels where the mean windspeed was less than 15 m/s, and

2) The skewness of the windspeed was below 2.5 at data levels where the mean windspeed was greater than 15 m/s.

A.3 Limitations

For the wind statistics, the correlation coefficients for like wind components and unlike wind components between altitude levels were not computed. Therefore, wind statistics with respect to altitude (profile) cannot be derived from the RRA statistics. For wind profile modeling techniques the user is referred to Smith (1976). However, the wind statistics at discrete altitudes are valid; all of the probability distribution functions given in chapter II can be derived from the five wind component statistical parameters contained in table I, and the derived distributions can be considered as wind models at discrete altitudes.

By convention, in the statistical literature Greek letters are used for population or theoretically known parameters, and sample estimates are denoted by English alphabetical letters or with a "hat" (^) over the Greek letters. In chapter II Greek letters are used for the variances and the linear correlation coefficient, and the means are denoted by $\overline{X}$ and $\overline{Y}$ when dealing with the bivariate normal distribution. It will always be understood that table I contains sample estimates of the statistical parameters and they are with respect to the meteorological U and V coordinate system.

B. Coordinate System and Computation of Statistical Parameters

B.1. Coordinate System

Wind measurements are recorded in terms of magnitude and direction. The wind direction is measured in degrees clockwise from true north and is the direction from which the wind is blowing. The wind magnitude (the modulus of the vector) is the scalar quantity and is referred to as windspeed or scalar wind. A statistical description that accounts for the wind as a vector quantity is appropriate and requires a coordinate system.

For the RRA the standard meteorological coordinate system has been chosen for the wind statistics, all tables of statistical parameters, and related discussions because the coordinate system used in aerospace and related applied fields has not always been consistent.

Using figure 1, the polar and Cartesian forms for the meteorological coordinate system are defined:

W = windspeed, scalar wind, or magnitude of the wind vector in meters per second.

θ = wind direction. θ is measured in degrees clockwise from true north and is the direction from which the wind is blowing.

U = zonal wind component, positive west to east, in meters per second.

V = meridional wind component, positive south to north, in meters per second.

The components θ and W define the polar form, and the U-V components define the Cartesian forms:

$$U = -W \sin\theta \quad , \quad 0 \leq \theta \leq 360° \tag{1}$$

$$V = -W \cos\theta . \tag{2}$$

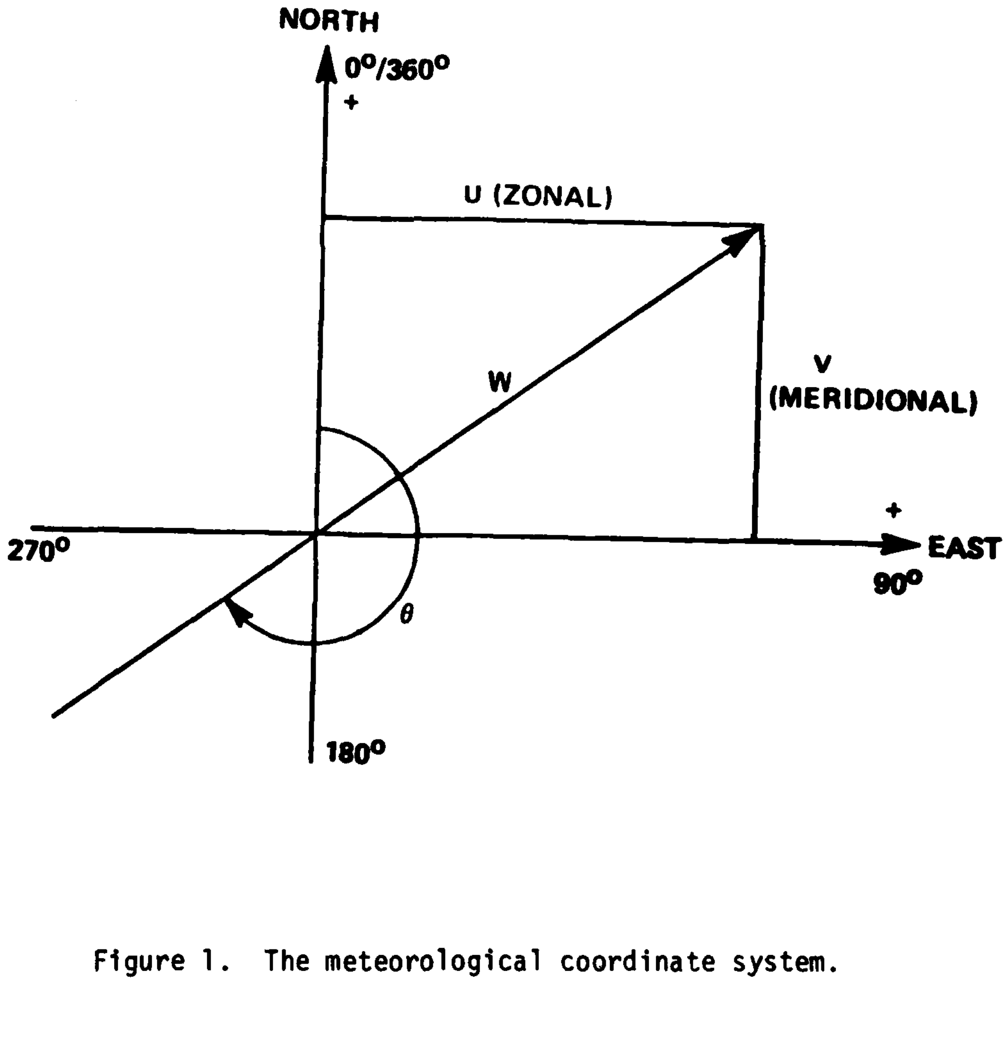


Figure 1. The meteorological coordinate system.

It is helpful to note the difference between the mathematical convention for a vector direction and the meteorological convention for wind direction:

$$\theta \text{ met} = 270 - \theta \text{ math} \tag{3}$$

when $0 \leq \theta$ math $\leq 270°$

$$\theta \text{ met} = 360 + (270 - \theta \text{ math})$$

when $270 \leq \theta$ math $\leq 360°$

B.2 Computation of Statistical Parameters

The wind statistical parameters in table I for the means and standard deviations of the U and V wind components and windspeed and the skewness parameter of windspeed were computed using the sums technique presented in chapter III.C.3. In addition, the linear (product moment) correlation coefficient between the U and V wind components, r (u,v) in table I, was computed. This correlation coefficient is defined as

$$r\,(u,v) = \frac{\sum_{i=1}^{n} (U_i - \bar{U})\,(V_i - \bar{V})}{N\,s(u) \cdot s(v)} \quad . \tag{4}$$

These statistical parameters are with respect to the Standard Meteorological Coordinate System.

C. Statistical Wind Models

C.1. Wind Component Statistics

The univariate normal (Gaussian) probability distribution function is used to obtain wind component statistics. In generalized notations, this probability density function (pdf) is

$$f\,(t) = \frac{e^{-\frac{t2}{2}}}{\sqrt{2\pi}} \quad , \tag{5}$$

where $t = X - \xi/\sigma_X$ is the standardized variate, with ξ defining the mean and σ_X the standard deviation. The probability distribution function (PDF) is

$$F(X) = \int_{-\infty}^{X} f(t)\,dt \quad . \tag{6}$$

Because this integral cannot be obtained in closed form, it is widely tabulated for zero mean and unit standard deviation. For a convenient reference for the RRA, selected values of F(X) are given in table B. To emphasize the connotation of probability, F(X) is shown in table B as $P\{X\}$. The t values in table B are used as multiplier factors to the standard deviation to express the probability that a normally distributed variable, X, is less than or equal to a given value as

$$P\left\{X \leq \text{mean} + t\ \sigma_x\right\} = \text{probability, } p \quad . \tag{7}$$

For example, when t = 1.6449, the probability that X is less than or equal to the mean plus 1.6449 standard deviations is 0.95. That value of X that is less than or equal to the mean plus 1.6449 standard deviations is called the 95th percentile value of X. Also given in table B are the numerical values to express the probability that X falls in the interval X_1 and X_2; i.e.,

$$P\left\{X_1 \leq X \leq X_2\right\} = \text{Interpercentile Range} \ , \tag{8}$$

where

$$X_1 = \bar{X} - t\ \sigma_x$$
$$X_2 = \bar{X} + t\ \sigma_x \quad .$$

For t = 1.9602 the probability that X lies in the interval X_1 and X_2 is 0.95. The values of X_1 and X_2 in this example comprise the 95th interpercentile range.

For a normally distributed variable, the mode (most frequent value) and the median (50th percentile value) are the same as the mean value. The means and standard deviations of the U and V wind components from table 1 are used in equations (7) and (8) to compute the percentile values and interpercentile ranges of the U and V wind components. When equation (7) is illustrated on a normal probability graph, a straight line is formed.

C.2. The Vector Wind Model

Because wind is a vector quantity having direction and magnitude that can be expressed as two components in an orthogonal coordinate system, a probability model that describes the joint relationship is the bivariate normal probability distribution. In general component notation, the bivariate normal probability density function (BNpdf) is

TABLE B. VALUES OF t FOR STANDARDIZED NORMAL (UNIVARIATE) DISTRIBUTION FOR PERCENTILES AND INTERPERCENTILE RANGES

t	$P(X)$	X	$P\{X_1 \leq X \leq X_2\}$ (%)
-3.0000	0.00135	$\xi - 3.0000\ \sigma$	
-2.5758	0.00500	$\xi - 2.5758\ \sigma$	
-2.3263	0.01000	$\xi - 2.3263\ \sigma$	
-2.2365	0.01266	$\xi - 2.2365\ \sigma$	
-2.0000	0.02275	$\xi - 2.0000\ \sigma$	
-1.9602	0.02500	$\xi - 1.9602\ \sigma$	
-1.6449	0.05000	$\xi - 1.6449\ \sigma$	
-1.2816	0.10000	$\xi - 1.2816\ \sigma$	
-1.0000	0.15866	$\xi - 1.0000\ \sigma$	
-0.8416	0.20000	$\xi - 0.8416\ \sigma$	
-0.6745	0.25000	$\xi - 0.6745\ \sigma$	
-0.2533	0.40000	$\xi - 0.2533\ \sigma$	
0.0000	0.50000	ξ	
0.2533	0.60000	$\xi + 0.2533\ \sigma$	20 (80)
0.6745	0.75000	$\xi + 0.6745\ \sigma$	50 (50)
0.8416	0.80000	$\xi + 0.8614\ \sigma$	60 (40)
1.0000	0.84134	$\xi + 1.0000\ \sigma$	68.268 (31.732)
1.2816	0.90000	$\xi + 1.2816\ \sigma$	80 (20)
1.6449	0.95000	$\xi + 1.6449\ \sigma$	90 (10)
1.9602	0.97502	$\xi + 1.9602\ \sigma$	95 (5)
2.0000	0.97725	$\xi + 2.0000\ \sigma$	95.45 (4.55)
2.2365	0.98734	$\xi + 2.2365\ \sigma$	97.468 (2.532)
2.3263	0.99000	$\xi + 2.3263\ \sigma$	98 (2.00)
2.5758	0.99500	$\xi + 2.5758\ \sigma$	99 (1.00)
3.0000	0.99865	$\xi\quad 3.0000\ \sigma$	99.73 (0.27)

where $X_1 = \xi - t\sigma$
and $X_2 = \xi + t\sigma$

$$f(X,Y) = \frac{1}{2\pi\sigma_x\sigma_y\sqrt{1-\rho^2}}\left[\exp\frac{-1}{2(1-\rho^2)}\left\{\frac{(X-\bar{X})^2}{\sigma_x^2}\right.\right.$$

$$\left.\left. - \frac{2\rho(X-\bar{X})(Y-\bar{Y})}{\sigma_x\sigma_y} + \frac{(Y-\bar{Y})^2}{\sigma_y^2}\right\}\right] \quad -\infty \leqq X \leqq \infty \text{ and}$$

$$-\infty \leqq Y \leqq \infty \quad , \tag{9}$$

where the five parameters are $\bar{x},\bar{y}$, the component means; σ_x, σ_y, the component standard deviations; and ρ, the correlation coefficient between the two component variables, X and Y.

For many applications the interest is in determining the probability that a point $\{X,Y\}$ will fall within a contour of equal probability density. The exponential terms of equation (9), when set equal to a constant, λ^2, give a family of ellipses depending on the value of the constant. The ellipses have a common center at the point $\{\bar{X},\bar{Y}\}$. Integration of equation (9) over the region bounded by the contours of equal probability density gives

$$P(\lambda) = 1 - e^{\frac{-\lambda^2}{2(1-\rho^2)}} \quad . \tag{10}$$

Solving for λ^2 and replacing $P(\lambda)$ by p gives

$$\lambda^2 = -2(1-\rho^2)\ln(1-p) \quad . \tag{11}$$

Now define

$$\lambda_e = \sqrt{2}\sqrt{-\ln(1-p)} \quad . \tag{12}$$

For ready reference and comparisons, λ_e is shown in table C for selected values of p.

TABLE C. VALUES OF λ FOR BIVARIATE NORMAL DISBRIBUTION ELLIPSES AND CIRCLES

P(%)	λ_e (ellipse)	λ_c (circle)	P(%)	λ_e (ellispe)	λ_c (circle)
0.000	0.0000	0.0000	65.000	1.4490	1.0246
5.000	0.3203	0.2265	68.268	1.5151	1.0713
10.000	0.4590	0.3246	70.000	1.5518	1.0973
15.000	0.5701	0.4031	75.000	1.6651	1.1774
20.000	0.6680	0.4723	80.000	1.7941	1.2686
25.000	0.7585	0.5363	85.000	1.9479	1.3774
30.000	0.8446	0.5972	86.466	2.0000	1.4142
35.000	0.9282	0.6563	90.000	2.1460	1.5175
39.347	1.0000	0.7071	95.000	2.4477	1.7308
40.000	1.0108	0.7147	95.450	2.4860	1.7579
45.000	1.0935	0.7732	98.000	2.7971	1.9778
50.000	1.1774	0.8325	98.168	2.8284	2.0000
54.406	1.2533	0.8862	98.889	3.0000	2.1213
55.000	1.2637	0.8936	99.000	3.0348	2.1460
60.000	1.3537	0.9572	99.730	3.4393	2.4320
63.212	1.4142	1.0000	99.9877	4.2426	3.0000

$$\lambda_c = \sqrt{2}\sqrt{-\ln(1-P)}$$

$$\lambda_c = \sqrt{-\ln(1-P)}$$

The probability ellipse that contains p-percent of the wind vectors expressed in the most general form is the conic defined by

$$AX^2 + BXY + CY^2 + DX + EY + F = 0 \quad , \tag{13}$$

where

$$A = \sigma_y^{\ 2}$$

$$B = -2\rho\sigma_x\sigma_y$$

$$C = \sigma_x^{\ 2}$$

$$D = 2\sigma_x\sigma_y\ \rho\bar{Y} - 2\sigma_y^{\ 2}\bar{X} = -\ (B\bar{Y} + 2A\bar{X})$$

$$E = 2\sigma_x\sigma_y\ \rho\bar{X} - 2\sigma_x^{\ 2}\bar{Y} = -\ (B\bar{X} + 2C\bar{Y})$$

$$F = A\bar{X}^2 + C\bar{Y}^2 + B\bar{X}\bar{Y} - AC\ (1 - \rho^2)\ \lambda_e^{\ 2} \quad ,$$

and

$$\lambda_e = \sqrt{2}\ \sqrt{-\ \ln\ (1 - \rho)} \quad .$$

For graphical presentations, the range of the variable is important in order to arrange the scale. The largest and smallest values of X and Y for a given probability ellipse, p, are given by

$$X_{L,S} = \bar{X} \pm \sigma_x\lambda_e \tag{14}$$

$$Y_{L,S} = \bar{Y} \pm \sigma_y\lambda_e \quad , \tag{15}$$

where, as, before, $\lambda_e = \sqrt{2}\ \sqrt{-\ln(1 - p)}$.

Although there are several approaches to graphing the probability ellipses, the following procedure is advantageous for electronic computer plotting. In establishing the computer plotting program, the sample estimates for $\overline{X}, \overline{Y}$, σ_x, σ_y, and ρ are constants in equation (13). The user makes the choice of probability ellipses desired. Thus, p in equation (12) is programmed as a parameter. The largest and smallest values for X and Y are computed by equations (14) and (15) for the largest probability ellipse selected. This sets the graphical scale. Values of X within the range of "X smallest" to "X largest" are obtained by incrementing X between these limits. Using the quadratic equation, a solution for Y of equation (13) is made and plotted for each value of X. The centroid $(\overline{X}, \overline{Y})$ for the family of probability ellipses is plotted as a point. Labeling and other identification complete the plotting program.

For a given probability, equation (13) defines an ellipse that contains p-percent of the points X,Y. Since the entire area under the bivariate normal density function [equation (9)] is unity, upon integration for a given probability ellipse, that given ellipse contains p-percent of the total area. In the wind statistics, p-percent of the wind vectors fall within the specified probability ellipse. From this point of view, a specified probability ellipse gives the joint probability that p-percent of the U-V components lie within the given ellipse.

When $\sigma_x^2 = \sigma_y^2 = \sigma^2$ and $\rho = 0$ in the bivariate normal distribution, the probability ellipses of equation (13) reduce to circles whose centers are at the means $\overline{X}, \overline{Y}$. The radii of the probability circles are $\sigma_{V1}\lambda_c$, where

$$\sigma_{V1} = \sqrt{2\sigma^2} \tag{16}$$

and

$$\lambda_c = \sqrt{-\ln(1 - p)} \quad . \tag{17}$$

Values for λ_c for selected probabilities, p, are given in table C.

Because this function is simple, it can easily be graphed manually. However, the generalized plotting technique for electronic computer plotters, as represented by equation (13), can be advantageously used.

C.3. Derived Distributions for Wind Statistics

In this subsection the probability distribution functions and sets of equations are presented to derive certain probability distribution functions for wind statistics. These derived probability distributions are:

1) The conditional distribution of wind components

2) The generalized Rayleigh distribution for windspeed

3) The distribution for wind direction

4) The conditional distribution of windspeed given a wind direction (wind rose).

The required five statistical parameters for these derived distributions for wind statistics are given in table I.

C.3.1 The Conditional Distribution of Wind Components

Given that two random variables X and Y are bivariate normally distributed, the conditional distribution $f(Y|X)$ is read as $f(Y)$ given X, and likewise $f(X|Y)$ is read as $f(X)$ given Y. The conditional probability distribution function $F(Y|X)$ has the mean $E(Y|X)$ and variance $\sigma^2_{(x|y)}$, where

$$E(Y|X^*) = \bar{Y} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(X^* - \bar{X}) \tag{18}$$

and

$$\sigma^2_{(y|x^*)} = \sigma_y^{\,2}\,(1 - \rho^2) \quad . \tag{19}$$

The conditional standard deviation is

$$\sigma_{(y|x^*)} = \sigma_y \sqrt{1 - \rho^2} \quad . \tag{20}$$

By interchanging the variables and parameters, the conditional distribution function for $F(X|Y^*)$ has the conditional mean

$$E(X|Y^*) = \bar{X} + \rho\left(\frac{\sigma_x}{\sigma_y}\right)(Y^* - \bar{Y}) \quad , \tag{21}$$

conditional variance

$$\sigma^2_{(x|y^*)} = \sigma_x^{\,2}\,(1 - \rho^2) \quad , \tag{22}$$

and conditional standard deviation

$$\sigma_{(x|y^*)} = \sigma_x \sqrt{1 - \rho^2} \quad . \tag{23}$$

The preceding conditional probability distribution functions are univariate normal distributions for a (fixed) given value for one of the bivariate normal variables. Thus, the t-values given in table B are applicable for conditional probability statements. For example,

$$F(Y|X^*) = E(Y|X^*) + t\sigma_{(y|x^*)} \quad . \tag{24}$$

For $t = 1.6449$ there is a 95 percent chance that Y is less than or equal to $\bar{Y} + 1.6449\ \sigma_{(y|x^*)}$ given that $X = X^*$. In symbols this statement reads

$$P\left\{ Y \le E(Y|X^*) + 1.6449\ \sigma_{(y|x^*)}\ |X = X^*\right\} = 0.9500 \quad . \tag{25}$$

Interval probability statements can also be made; namely,

$$P\left\{ Y_1 = E(Y|X^*) - t\sigma_{(y|x^*)} \leqq Y \leqq Y_2 = E(Y|X^*) + t\sigma_y\ |X = X^*\right\}$$

where X^* can take on any fixed value of X, but a convenient arrangement is to let $X^* = \bar{X} \pm t\sigma_x$.

The close connection of the regression function of Y on X to the conditional mean for the bivariate normal distribution is noted; namely,

$$Y = \bar{Y} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(X - \bar{X}) \quad . \tag{26}$$

Similarly, the regression function of X on Y is

$$X = \bar{X} + \rho\left(\frac{\sigma_y}{\sigma_x}\right)(Y - \bar{Y}) \quad . \tag{27}$$

These are linear functions and express the same results as would be obtained from a least-squares regression line.

C.3.2. The Generalized Rayleigh Distribution for Windspeed

If two random variables, X and Y, are bivariate normally distributed, then the probability distribution for the modulus, R, can be derived in terms of the five parameters that define the bivariate normal distribution.

$$R = \sqrt{X^2 + Y^2} \tag{28}$$

The distribution of R so derived is called a generalized Rayleigh distribution because there are no restrictions on the parameters. For applications to the RRA, the variable R is recognized as windspeed or the modulus of the wind vector.

The probability density function for R is expressed as

$$f(R) = a_0 R e^{-a_1 R^2} \left[I_0(a_2 R^2)\, I_0(a_3 R) + 2\sum_{k=1}^{\infty} I_k(a_2 R^2)\, I_{2k}(a_3 R) \cos 2k\psi \right] R \geqq 0 \quad . \tag{29}$$

The functions, $I_0(\cdot)$, $I_k(\cdot)$, and $I_{2k}(\cdot)$ are the modified Bessel functions of the first kind for zero order, kth order, and 2kth order. The coefficients are

$$a_0 = \exp\left[-\frac{1}{2}\left\{\frac{\bar{X}^2}{\sigma_a^2} + \frac{\bar{Y}^2}{\sigma_b^2}\right\}\right] \Big/ \sigma_a\sigma_b \quad ,$$

where σ_a^2 and σ_b^2 are the rotated variances to produce zero correlation between X and Y. σ_a and σ_b are the positive and negative roots[1] of the expression

$$\sigma^2_{(+,-)} = \frac{1}{2}\left\{\sigma_x^2 + \sigma_y^2 \pm \left[(\sigma_x^2 + \sigma_y^2)^2 - 4\sigma_x^2\sigma_y^2(1 - \rho^2)\right]^{1/2}\right\} \quad ,$$

$$a_1 = (\sigma_x^2 + \sigma_y^2)/4(1 - \rho^2)\ \sigma_x^2\sigma_y^2 \quad ,$$

$$a_2 = \frac{\left[(\sigma_x^2 - \sigma_y^2)^2 + 4\rho^2\sigma_x^2\sigma_y^2\right]^{1/2}}{4(1 - \rho^2)\ \sigma_x^2\sigma_y^2} \quad ,$$

$$a_3 = \left[\left(\frac{\bar{X}}{\sigma_a^2}\right)^2 + \left(\frac{\bar{Y}}{\sigma_b^2}\right)^2\right]^{1/2} \quad ,$$

1. This computational form is obtained from the determinant

$$\begin{vmatrix} \sigma_x^2 - K & \sigma_x\sigma_y\rho \\ \sigma_x\sigma_y\rho & \sigma_y^2 - K \end{vmatrix} ,$$

where K is $\sigma^2_{(+,-)}$*, and* σ_a *and* σ_b *are analogous to the standard deviation of the major and minor axes of the bivariate normal probability ellipse.*

and

$$\tan \psi = \frac{\bar{\bar{Y}}}{\bar{\bar{X}}} \frac{\sigma_a^{\,2}}{\sigma_b^{\,2}} \quad .$$

Since this density function cannot be integrated in closed form from zero to R, numerical integration is used to obtain practical results for the probability distribution function; i.e.,

$$F(R) = \int_0^{R*} f(R)\, dR \quad . \tag{30}$$

A number of special cases can be obtained from the general Rayleigh distribution [equation (29)], the simplest of which is to let $\sigma_x \equiv \sigma_y = \sigma$ and $\bar{X} = \bar{Y} = 0$ with independent variables X and Y. This gives

$$f(R) = \frac{R}{\sigma^2} e^{-R^2/2\sigma^2} \quad , \tag{31}$$

which is recognized as the classical Rayleigh probability density function. The density function, equation (31), can be integrated in closed form over any range of the variable R. Hence, the probability distribution function, F(R), for equation (31) is

$$F(R) = 1 - \exp\left\{\frac{-R^2}{2\sigma^2}\right\} \quad . \tag{32}$$

C.3.3. The Derived Distribution of Wind Direction

Considering the wind as a vector quantity and bivariate normally distributed, the wind direction can be derived. This is done by first writing the bivariate normal probability density function in polar coordinates whose variables are

$$g(r,\theta) = r d_1 e^{-\frac{1}{2}(a^2r^2 - 2br + c^2)} , \tag{33}$$

(see footnote 2)

where

$$a^2 = \frac{1}{(1-\rho^2)}\left[\frac{\sin^2\theta}{\sigma_x^2} - \frac{2\rho\cos\theta\sin\theta}{\sigma_x\sigma_y} + \frac{\cos^2\theta}{\sigma_y^2}\right] ,$$

$$b = \frac{-1}{(1-\rho^2)}\left[\frac{\bar{x}\sin\theta}{\sigma_x^2} - \frac{\rho(\bar{x}\cos\theta + \bar{y}\sin\theta)}{\sigma_x\sigma_y} + \frac{\bar{y}\cos\theta}{\sigma_y^2}\right] ,$$

$$c^2 = \frac{1}{(1-\rho^2)}\left[\frac{\bar{x}^2}{\sigma_x^2} - \frac{2\rho\bar{x}\bar{y}}{\sigma_x\sigma_y} + \frac{\bar{y}^2}{\sigma_y^2}\right] ,$$

$$d_1 = \frac{1}{2\pi\sigma_x\sigma_y\sqrt{1-\rho^2}} ,$$

$r = \sqrt{x^2 + y^2}$ is the modulus of the vector or speed, and θ is the direction of the vector. After integrating $g(r,\theta)$ over $r = 0$ to ∞, the probability density function of θ is

$$g(\theta) = \frac{d_1}{a^2}\, e^{-\frac{1}{2}c^2}\left[1 + \sqrt{2\pi}\left(\frac{b}{a}\right) e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} \Phi\left(\frac{b}{a}\right)\right] , \tag{34}$$

---

2. This expression, equation (33), in Smith (1976) is given with respect to the mathematical convention for a vector direction.

where a^2, b, c^2, and d_1 are as previously defined in equation (33) and

$$\Phi\left(\frac{b}{a}\right) = \Phi\ (x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2}t^2}\ dt$$

is taken from tables of normal distribution functions or made available through a computer subroutine.

If desired, equation (34) can be integrated numerically over a chosen range of θ to obtain the probability that the vector direction will lie within the chosen range; i.e.,

$$F(\theta) = \int_{\theta_2}^{\theta_1} g(\theta)\ d\theta \quad . \tag{35}$$

One application may be to obtain the probability that the wind will flow from a given quadrant or sector as, for example, onshore.

C.3.4. The Derived Conditional Distribution of Windspeed Given the Wind Direction (Wind Rose)

Continuing with the considerations in section C.3.3. of this chapter, the conditional probability density function (pdf) for windspeed, r, given a specified value for the wind direction, θ, can be expressed as

$$f(r\,|\,\theta) = \frac{a^2\ r\ e^{-\frac{1}{2}(a^2\ r^2\ -\ br)}}{1 + \sqrt{2\pi}\left(\frac{b}{a}\right) e^{\frac{1}{2}\left(\frac{b}{a}\right)^2} \Phi\left\{\frac{b}{a}\right\}} \quad , \tag{36}$$

where the coefficients, a and b and the function $\Phi\left\{\frac{b}{a}\right\}$ are as previously defined in equation (33) and in equation (34).

From equation (36) the mode (most frequent value) of the conditional windspeed given a specified value of the wind direction is the positive solution of the quadratic equation,

$$a^2\ r^2\ -\ br\ -\ 1 = 0 \quad , \tag{37}$$

which is

$$(\tilde{r}\,|\,\theta) = \frac{1}{2a}\left[\left(\frac{b}{a}\right) + \sqrt{4 + \left(\frac{b}{a}\right)^2}\right] \quad . \tag{38}$$

The locus of the conditional modal values of windspeed when plotted in polar form versus the given wind directions forms an ellipse.

The noncentral moment for equation (36) is expressed as

$$\mu_n' = \int_0^\infty r^n \, f(r\,|\,\theta)\, dr \quad . \tag{39}$$

Now the first noncentral moment is identical to the first central moment or the expected value, $E\,(r|\theta)$. The integration of equation (39) for the first moment is sufficiently simple to yield practical computations and can be expressed as

$$E(r\,|\,\theta) = \frac{\left(\frac{b}{a}\right) + \left[1 + \left(\frac{b}{a}\right)^2\right]\sqrt{2\pi}\; e^{\frac{1}{2}\left(\frac{b}{a}\right)^2}\; \Phi\left\{\frac{b}{a}\right\}}{a\left[1 + \left(\frac{b}{a}\right)\sqrt{2\pi}\; e^{\frac{1}{2}\left(\frac{b}{a}\right)^2}\; \Phi\left\{\frac{b}{a}\right\}\right]} \quad . \tag{40}$$

Hence, equation (40) gives the conditional mean value of the windspeed given a specified value for the wind direction.

The integration of equation (36) for the limits $r = 0$ to $r = r^*$ gives the probability that the conditional windspeed is $\leq r^*$ given a value for the wind direction, θ. This conditional probability distribution (PDF) can be written as

$$Pr\left\{r \leq r^* \mid \theta = \theta_o\right\} = 1 - \left[\frac{e^{-\frac{1}{2}r_s^2} + \sqrt{2\pi}\left(\frac{b}{a}\right)\left\{1 - \Phi\,(r_s)\right\}}{e^{-\frac{1}{2}\left(\frac{b}{a}\right)^2} + \sqrt{2\pi}\left(\frac{b}{a}\right)\Phi\left\{\frac{b}{a}\right\}}\right] . \tag{41}$$

where

$$r_s = \left[a\, r^* - \left(\frac{b}{a}\right)\right] \quad .$$

By definition, equation (41) is an expression for a "wind rose." Empirical wind rose statistics are often tabulated or graphically illustrated giving the frequency that the windspeed is not exceeded for those windspeed values that lie within assigned class intervals of the wind direction. After evaluation of equation (41) for various values of windspeed, r^*, and the given wind directions, θ, interpolations can be performed to obtain various percentile values of the conditional windspeed.

For the special case when $\underline{b}$ in equation (33) equals zero (i.e., for $\overline{x} \equiv \overline{y} = 0$), the conditional modal values of windspeeds [equation (38)], the conditional mean values of windspeeds [equation (40)], and the fixed conditional percentile values of windspeeds [interpolated from evaluations of equation (41)], when plotted in polar form versus the given wind directions, produce a family of ellipses.

For the special case when $\overline{x} = \overline{y} = 0$, equation (36) reduces to the following simple case:

$$\Pr\left\{ r \leq r^* \mid \theta = \theta_0 \right\} = 1 - e^{-\frac{a^2 r^{*2}}{2}} \quad . \tag{42}$$

There is a special significance of equation (42) when related to the bivariate normal probability distribution. If r^* and θ are measured from the centroid of the probability ellipse, then the probability that $r \leq r^*$ is the same as the given probability ellipse. Further, solving equation (42) for r^*, gives

$$r^* = \frac{1}{a} \sqrt{-2 \ln (1 - P)} \quad . \tag{43}$$

If a probability ellipse P is chosen, equation (42) gives the distance of r along any θ from the centroid of the ellipse to the intercept of the specified probability ellipse. If there is an interest in conditional probability of winds for a given θ relative to the monthly means, equation (43) is applicable. If it is desired to find the magnitude of the wind along any θ relative to the monthly mean to the intercept of a given probability ellipse, equation (43) is applicable.

D. Statistical Parameters With Respect To Any Orthogonal Axes

The five wind statistical parameters presented in table I are given with respect to the standard meteorological coordinate system; i.e., these parameters are for the U and V components. For many aerospace vehicles and range applications, there is a need for wind statistics with respect to orthogonal axes other than west to east and south to north. For example, it may be required to present wind statistics with respect to a flight azimuth of an

aerospace vehicle whose flight azimuth is α degrees from true north measured in a clockwise direction. The following sets of equations are presented to compute the five parameters for the new coordinate axes rotated α degrees clockwise from true north.

a. Rotation of the means through α degrees:

$$\bar{X}_\alpha = \bar{X} \cos (90 - \alpha) + \bar{Y} \sin (90 - \alpha) \tag{44}$$

$$\bar{Y}_\alpha = \bar{Y} \cos (90 - \alpha) - \bar{X} \sin (90 - \alpha) \quad . \tag{45}$$

b. Rotation of the variances through α degrees:

$$\sigma_{x_\alpha}^{2} = \sigma_x^{2} \cos^2 (90 - \alpha) + \sigma_y^{2} \sin^2 (90 - \alpha)$$

$$+ 2\rho\sigma_x\sigma_y \cos (90 - \alpha) \sin (90 - \alpha) \tag{46}$$

$$\sigma_{y_\alpha}^{2} = \sigma_y^{2} \cos^2 (90 - \alpha) + \sigma_x^{2} \sin^2 (90 - \alpha)$$

$$- 2\rho\sigma_x\sigma_y \cos (90 - \alpha) \sin (90 - \alpha) \quad . \tag{47}$$

c. Rotation of the linear correlation coefficient through α degrees:

$$\rho_\alpha = \frac{\text{cov}\ (X,Y)_\alpha}{\sigma_{x_\alpha}\sigma_{y_\alpha}} \quad , \tag{48}$$

where cov $(X,Y)_\alpha$ is the rotated covariance,

$$\text{cov}\ (X,Y)_\alpha = \text{cov}\ (X,Y)\ [\cos^2 (90 - \alpha) - \sin^2 (90 - \alpha)]$$

$$+ \cos (90 - \alpha) \sin (90 - \alpha) (\sigma_y^{2} - \sigma_x^{2})$$

and

$$\mathrm{cov}\ (X,Y) = \rho\sigma_x\sigma_y \quad .$$

By using these rotational equations, the bivariate normal distribution with respect to any desired rotated coordinates can be obtained from sample estimates that have been computed with respect to a specific axis. The marginal distributions after rotation are also normally (univariate) distributed. Using the rotational equations greatly reduces computational efforts for applications requiring statistics with respect to several coordinate axes.

Appendix A presents some illustrative examples for the wind statistics of the specific RRA.

CHAPTER III. STATISTICS OF THERMODYNAMICS QUANTITIES AND MODELS

A. General Considerations

A.1. Objectives

The objective inherent in developing the thermodynamic section of the RRA was to describe the thermodynamic characteristics of the atmosphere using a minimum of data tabulations. A set of parameters was selected which, together, thermodynamically describe the climatological state of the atmosphere. These parameters are the pressure, temperature, density, dewpoint, virtual temperature, and water vapor pressure. Used together, these parameters permit the calculation of a large number of derived quantities. (Symbols used in the calculations in this chapter are summarized in table D.) Some of these quantities, such as the speed of sound, are dealt with in section III.E.

The probability distribution of each of the six thermodynamic RRA parameters is described by its mean value, its standard deviation, and its skewness. Several of these parameters (temperature, pressure, dewpoint and density) have probability distributions that are close to a univariate normal distribution; the others do not. The skewness parameter gives an estimate of the asymmetrical departures of a probability distribution.

Hydrostatically modeled mean values of pressure and density were calculated (table IV), so that users may determine the departure of the actual climatological values of these parameters from hydrostatic conditions. This was done by hydrostatically integrating the pressure from the lowest RRA data level to the termination altitude of the particular RRA.

A.2. Data Quality Control

Data limits derived from the following parameters were used to screen the thermodynamic portion of the RRA data base: temperature, pressure, dewpoint (for the 0- to 30-km portion only), and density (for the 30- to 70-km portion only). These limits were set to plus and minus six standard deviations from the mean values of each of these quantities. These limits were used to screen the thermodynamic portion of the RRA data base, according to the procedures described in section I.C. The data base used to generate the thermodynamic portion of the RRA (tables I, II, and IV) was considered to be free from errors under the following conditions:

a) The skewness values of the pressure and temperature were between -2.5 and 2.5 at all data levels.

b) The skewness values of the density were between -3.5 and 3.5 at data levels between 0 and 30 km.

c) The skewness values of the density were between -3.0 and 3.0 at data levels between 30 and 70 km.

d) The skewness values of the dewpoint were between -2.5 and 2.5 at all data levels with more than 10 data values.

TABLE D. LIST OF SYMBOLS USED IN CHAPTER III

C_s - Speed of sound

C_d - Collision diameter

E - Vapor pressure

g_ϕ - Gravity at latitude ϕ

H - Geopotential height

H_m - Geopotential height at a mandatory radiosonde data level

H_s - Geopotential height at a significant radiosonde data level

K_t - Coefficient of thermal conductivity

L - Mean free path length

M - Mean molecular weight of air at sea level

M3Q - Annual or monthly third moment of quantity Q

n - Refractive modulus

N - Refractive index

NA - Avogadro's constant

N_Q - Number of values of quantity Q

P - Pressure

P_m - Pressure at a mandatory radiosonde data level

P_s - Pressure at a significant radiosonde data level

P_h - Hydrostatically integrated mean monthly or annual pressure

Q - Any tabulated RRA quantity

R* - Universal gas constant

R' - Specific gas constant of dry air

r', r* - Parameters used in converting z to h and vice versa

TABLE D. (concluded)

S	- Sutherland's constant, used in the calculation of dynamic viscosity
T	- Temperature
T_d	- Dew point
T_v	- Virtual temperature
T_{vm}	- Virtual temperature at a mandatory radiosonde data level
T_{vs}	- Virtual temperature at a significant radiosonde data level
V	- Mean air particle speed
V_c	- Mean collision frequency
w	- Parameter used in the hydrostatic interpolation of pressure and density
Z	- Geometric altitude
λ	- Wavelength
α_Q	- Skewness of quantity Q
β	- Constant used in the equation for viscosity
γ	- Ratio of specific heat at constant pressure to specific heat at constant volume
η	- Kinematic coefficient of viscosity
μ	- Dynamic coefficient of viscosity
ρ	- Density
ρh	- Mean monthly or annual density derived from pressure height
σ	- Standard deviation of the quantity Q

A.3 Limitation of Thermodynamic Statistics

The correlation coefficients between the thermodynamic quantities and the moisture-related quantities were not calculated at discrete altitudes, nor were any of the correlations between altitudes. Therefore, valid statistical dispersion models that require the relationship between two or more of these quantities at the same altitude or between altitudes cannot be derived. Approximations for the correlation coefficients between pressure, virtual temperature, and density at discrete altitudes may be obtained from the coefficients of variation as developed by Buell (1970). The coefficient of variation is the standard deviation divided by the mean. The mean values and the standard deviations are taken from table II. A model for the profile of monthly and annual mean pressure, virtual temperature, and density that is in excellent agreement with the respective statistical mean values is given by table IV. This agreement results because the physical relationships, given by the hydrostatic equation and the equation of state, were used to derive table IV. When only the monthly or annual mean values for pressure, virtual temperature, and density are required, it is recommended that table IV be used.

B. Establishing Data Samples at the Required Altitude Levels

This section describes the computational procedures used to establish data samples of the thermodynamic RRA parameters at the RRA data levels. References are cited only when an equation given is one of many available in the literature or when an equation is stated in an unusual form.

B.1. Conversion of Data Recorded in Geopotential Heights to Geometric Altitude

The upper-air rocketsonde observations used to obtain the table values above 30 km were recorded in terms of geometric altitude and can be interpolated directly to the altitude intervals shown in the tables. However, the radiosonde observations used to obtain the tabular values below 30 km were recorded in terms of geopotential heights. The change of coordinates from geopotential heights to geometric altitudes (h to z) is accomplished by calculating a table of geopotential heights that correspond exactly to the geometric altitudes at which the atmospheric parameters are tabulated. The radiosonde observations are then interpolated to these geopotential heights. The relationship used to calculate geometric altitude from geopotential height is

$$H = (r'z)/(r^*z) \quad , \tag{49}$$

where

$$r' = gr^*/9.80665$$

and

$$r^* = -2g_\phi/(\partial g_\phi/\partial z_o) \quad .$$

g_ϕ is the sea-level gravity at the latitude ϕ corresponding to the proper location. This value is given by (List, 1968)

$$g_\phi = 9.780356\ (1 + 5.2885 \times 10^{-3} \sin^2\phi - 5.9 \times 10^{-6} \sin^2 (2\phi)). \quad (50)$$

$\frac{\partial g_\phi}{\partial z_o}$ is the rate of change of gravity at the sea level. This quantity is given by the equation

$$\frac{\partial g_\phi}{\partial z_o} = -3.085462 \times 10^{-6} + 2.27 \times 10^{-9} \cos (2\phi) - 2 \times 10^{-12} \cos (4\phi). \quad (51)$$

The units used for gravity are meters per square second, while the units for $\frac{\partial g_\phi}{\partial z_o}$ are per square second.

The resulting table of values of H obtained by using even increments of 2 in equation (49) is shown in table IV of the RRA. The values of H above 30 km are not used in the interpolation of original data, but are included for the convenience of the user.

B.2. Calculations on the Original Rawinsonde Data Records

It was necessary to interpolate the information from the original rawinsonde data records to the geometric altitudes specified as the RRA data levels. The parameters for which this interpolation was required were the temperature, dewpoint, and pressure. The other parameters were calculated from the interpolated values at each RRA data level. These "derived" parameters were the water vapor pressure, density, and virtual temperature.

B.2.1. Calculation of the Geopotential Height at Significant Levels

Two somewhat different interpolation procedures were used to obtain data from radiosonde and rocketsonde observations at the levels shown in the tables. The procedure used to interpolate radiosonde observations began with the calculation of virtual temperature at each data level in a sounding. The virtual temperature was computed by

$$T_v = T/(1. - 0.379\ (e/p)) \quad (52)$$

where T_v and T are in degrees Kelvin and e and p are in millibars.

The radiosonde soundings contain a mix of data taken at "mandatory" and "significant" levels. Pressure, temperature, and dewpoint information was given in these soundings at both types of levels. However, geopotential height information was only given at the mandatory levels. The heights at the significant levels were "filled in" (calculated) hydrostatically using pressure and temperature data from these levels. This procedure permitted the use of most of the significant level data in the calculation of the RRA tables. The equation used for this process was

$$H_s = H_m + 29.2712617 \; \frac{(T_{vs} - T_{vm})}{2} \; \ln(P_s/P_m) \quad , \tag{53}$$

where the subscripts s and m denote quantities at significant and mandatory levels. This equation was not used if the difference between two adjacent mandatory levels was greater than 200 mb. All soundings with such data gaps were rejected for use in compiling the RRA.

B.2.2. Temperature

Radiosonde temperatures were interpolated logarithmically with respect to pressure using the equation

$$T = T_U + (T_L - T_U) \frac{\ln p - \ln p_L}{\ln p_U - \ln p_L} \quad , \tag{54}$$

where the subscripts U and L indicate values at the nearest data levels in the actual sounding above and below the interpolated level.

B.2.3. Pressure

The pressure values in each radiosonde sounding were interpolated to the RRA data levels using the equation

$$p = p_L \exp\left(\frac{H_L - H_U}{29.2712617\ (0.5)\ (T_{v_U} + T_{v_L})} \right) \tag{55}$$

where the subscript L indicates virtual temperature, geopotential height, and pressure values at the data level below and closest to the level at which data were required.

B.2.4. Dewpoint Temperature

Dewpoint values were interpolated logarithmically with respect to pressure using the equation

$$T_d = T_{dU} + (T_{dL} - T_{dU}) \left(\frac{\ln p - \ln p_L}{\ln p_U - \ln p_L} \right) \quad . \tag{56}$$

The subscripts U and L indicate data at the nearest upper and lower data levels in a sounding.

B.2.5. Derived Water Vapor Pressure

The water vapor pressure was calculated from the interpolated dewpoint values at the RRA data levels using Teten's approximation:

$$e = 6.11 \text{ mb} \times 10^{7.5(T_d - 273.15)/(T_d - 35.86)} \quad . \qquad (57)$$

B.2.6. Derived Density

The density values derived from radiosonde observations were calculated at the RRA data levels using the equation

$$\rho = 348.36787 \; p/T_v \quad . \qquad (58)$$

B.2.7. Derived Virtual Temperature

The virtual temperature values were calculated at the RRA data levels for each sounding using the equation

$$T_v = T/(1 - 0.379(e/p)) \quad , \qquad (59)$$

where T_v and T are in degrees Kelvin, and p and e are the pressure and vapor pressure, respectively, in millibars.

B.3. Calculations on the Original Rocketsonde Data Records

The rocketsonde data records used to calculate the RRA table values above 30 km were given in terms of geometric altitude. For this reason, slightly different calculations were required to convert the recorded data values to values at the RRA data levels. The pressure, temperature, and density were all interpolated to the RRA data levels; moisture-related parameters (virtual temperature, water vapor pressure, and dewpoint) were not calculated, since atmospheric moisture at altitudes above 30 km was considered to be negligible.

No interpolation was done across gaps in the pressure or temperature data within a sounding larger than 7,000 m. Data values at the RRA levels within such a gap were set to missing.

B.3.1. Temperature

Rocketsonde temperatures were interpolated linearly with respect to geometric altitude using the equation

$$T = T_U + (T_L - T_U) \frac{Z - Z_L}{Z_U - Z_L} , \qquad (60)$$

where the subscripts U and L indicate values at the nearest data level in the actual sounding above and below the interpolated level.

B.3.2. Pressure

The pressure values in each rocketsonde sounding were interpolated to the RRA data levels using the equation

$$P = P_L \exp\left(-\frac{g_\phi}{R^*} \frac{M(Z - Z_L)}{\bar{T}v} \cdot W^2\right) , \qquad (61)$$

where $\bar{T}_v = \frac{Tv_U + Tv_L}{2}$ and $W = \frac{r^*}{\left(r^* + Z + \frac{Z - Z_L}{2}\right)}$.

B.3.3. Density

Rocketsonde density values were interpolated using the equation

$$\rho = \rho_L \exp\left(- \frac{g_\phi M}{R^*} \frac{(Z - Z_L)}{\bar{T}_v} \cdot W^2 \right) , \qquad (62)$$

where W is specified in section III.B.3.2.

C. Computation of Statistical Parameters for Tables II and III

A three-step procedure was used for computing the monthly and annual means, standard deviations, and skewness values from the data values at the RRA data levels. Initially, certain statistical sums were calculated and stored as the soundings in the data base were processed. These sums were then used to calculate the monthly statistics given in the RRA tables. The annual statistics were then calculated from these stored sums and the monthly statistics.

C.1. Stored Statistical Sums

The sums calculated were

$$\sum Q, \ \sum Q^2, \text{ and } \sum Q^3 \quad ,$$

where Q is any one of the quantities given in the thermodynamic part of the RRA.

C.2. Calculation of the Monthly Statistics

C.2.1. Monthly Means

The mean monthly values of the thermodynamic RRA quantities were calculated using the equation

$$\bar{Q} = \sum Q/N_Q \quad ,$$

where N_Q is the number of observed values of the quantity Q for a given month.

C.2.2. Monthly Standard Deviations

The monthly standard deviations of the thermodynamic RRA quantities were calculated using the equation

$$\sigma_Q = \sqrt{\frac{(N_Q \Sigma' Q^2) - (\Sigma Q)^2}{N_Q \cdot (N_Q - 1)}} \quad . \tag{63}$$

C.2.3. Monthly Skewness Values

The monthly skewness values of the windspeed and of the thermodynamic RRA quantities were calculated using the equation

$$\alpha_Q = \frac{M3_Q}{\sigma_Q^{\ 3}} \quad ,$$

where $M3_Q$ is the third moment of the quantity Q, σ_Q is its standard deviation, and

$$M_{3Q} = \left[\frac{\Sigma_Q^{\ 3}}{N_Q} - \frac{3\Sigma_Q \Sigma_Q^{\ 2}}{N^2_{\ Q}} - \frac{2\Sigma_Q^{\ 3}}{N^3_{\ Q}} \right] \cdot \frac{N_Q^{\ 2}}{(N_Q - 1)(N_Q - 2)} \quad . \tag{64}$$

C.3. Calculation of the Annual Statistics

Equations (63) and (64), used to calculate the monthly values of the standard deviations and skewness values, involve taking the differences between two pairs of large sums containing Q^2 and Q^3, where Q is the thermodynamic RRA quantity. Using these equations to compute the annual statistics would have resulted in a substantial loss of precision, as these sums become larger by several orders of magnitude in such a case. This problem was avoided by calculating the annual means, standard deviations, and skewness values from the monthly statistics.

C.3.1 Annual Mean Values

The annual mean values of the thermodynamic RRA quantities were calculated using the equation

$$Q_{ANN} = Q_A / N_Q \quad ,$$

where Q_A is the total of all observed values of Q and N_Q is the total number of observations of Q.

C.3.2. Annual Standard Deviations

The annual standard deviations of the thermodynamic RRA quantities were calculated using the equation

$$\sigma Q_{ANN} = \sqrt{\frac{1}{N_Q} \sum_{i=1}^{12} (N_{Qi}\ \sigma_{Qi}{}^2) + \frac{1}{N_Q} \sum_{i=1}^{12} (N_{Qi}\ \bar{Q}_i{}^2) - Q_{ANN}{}^2} \quad , \tag{65}$$

where N_{Qi} = the number of data values for Q in month i (i = 1 to 12), Q_i = the monthly mean of Q, and σ_{Qi} = the standard deviation of quantity Q in month i.

C.3.3. Annual Skewness Values

The annual skewness values of the thermodynamic RRA quantities were calculated using the equation

$$M3Q_{ANN} = \frac{1}{N} \sum_{i=1}^{12} (N_{Qi} M_{3Qi}) + \frac{3}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} \bar{Q}_i \sigma_{Qi}^2)$$

$$+ \frac{1}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} Q_i^3) - \frac{3\bar{Q}_{ANN}}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} Q_i^2)$$

$$- \frac{3\bar{Q}_{ANN}}{NQ_{ANN}} \sum_{i=1}^{12} (N_{Qi} \sigma_{Qi}^2) + 2\bar{Q}_{ANN}^3 \quad , \qquad (66)$$

where M_{3Qi} = the third moment about the mean of quantity Q in month i and $M3Q_{ANN}$ = the annual third moment about the mean of the quantity Q.

D. Derived Monthly Mean and Annual Mean Model Atmospheres

A set of modeled monthly mean and annual mean hydrostatic values of pressure and density was calculated from the lowest RRA data level (0 km, mean sea level) upwards to 30 km, and from 30 km upwards to 70 km. The integration from 0 to 30 km was computed independently of the integration from 30 to 70 km because of the difference in data sources. The two different values for 30 km are provided for comparison. When 30-km data are required, the values given in the 0- to 30-km table should be used. These hydrostatically modeled mean values, which are given in table IV, are useful as a check on the validity of the pressure and density values given in table II. In most cases, the values in tables II and IV for any given data level are within 1 percent of each other. The hydrostatic pressure values in table IV were calculated using the equation

$$p_1 = p_0 \exp\left(- \frac{0.034162 \ (H_1 - H_0)}{0.5 \ (T_{v_1} + T_{v_0})} \right) , \qquad (67)$$

where $H_1 - H_0$ is in meters and a "0" subscript refers to values at the RRA data level immediately below the level being checked. p_0 at the lowest data level is set equal to the RRA mean pressure; p_1, calculated for the next highest data level, is taken as p_0 for the level above that. This process is repeated for all the other RRA data levels. The hydrostatic density corresponding to the hydrostatic pressures is calculated from these pressures and the RRA virtual temperature values using the formula

$$\rho_H = 348.36786 \ P_H/T_v \quad , \qquad (68)$$

where ρ_H and P_H are the hydrostatic density and pressure shown in table IV of the RRA.

E. Thermodynamic Quantities Derivable from the Basic Tables

Several other quantities can be calculated from the statistics listed in tables I and II. Primary physical constants used in these calculations are listed in table E. The equations given in this section can be used to calculate the approximate mean values of these quantities at each RRA data level. It is not possible to infer or derive any information concerning the standard deviation or skewness values of these quantities from the data in tables II and III of the RRA.

E.1. Mean Air Particle Speed

The mean air particle speed, V, is the arithmetic average of the speeds of all air particles in the volume element being considered. For a valid average to occur, there must be a sufficient number of particles involved to represent mean conditions. The equation for V for dry air is

$$V = \sqrt{\frac{8}{\pi} \cdot \frac{R^*T}{M}} \quad . \tag{69}$$

A computational form for dry air, using tabulated values, is

$$V = \sqrt{7.3094 \times 10^2 \times T} \text{ (meters per second)} \quad , \tag{70}$$

where T is the temperature in degrees Kelvin from table II. Equation (69), when corrected for moist air, becomes

$$V = \sqrt{\frac{8}{\pi} \cdot R' \, T_v} \quad . \tag{71}$$

The computational form for moist air is

$$V = \sqrt{7.3094 \cdot 10^2 \cdot T_v} \text{ (meters per second)} \quad , \tag{72}$$

where T_v is the virtual temperature in degrees Kelvin from table III.

TABLE E. LIST OF PRIMARY PHYSICAL CONSTANTS

P_o = standard atmospheric pressure at sea level
= 1.013250×10^5 Newton/m^2 = 2116.22 lb/ft^2

ρ_o = standard atmospheric density at sea level
= 1.2250 kg/m^3 = 0.076474 lb/ft^3

T_o = standard temperature at sea level = 288.15 K = 15.0°C = 59.0°F

g_o = standard gravity at sea level at latitude 45°32'33"
= 9.80665 m/s^2

s = Sutherland's constant used in calculation of dynamic viscosity
= 110.4 K

T_I = ice-point temperature at P_o = 273.15 K

β = constant used in calculation of dynamic viscosity
= 1.458×10^{-6} kg/s m K$^{1/2}$
= 7.3025×10^{-7} lb/s ft R$^{1/2}$

γ = ratio of specific heat of air at constant pressure to specific heat of air at constant volume
= 1.4

C_D = mean effective collision diameter of air molecules
= 3.65×10^{-10} m = 1.1975×10^{-9} ft

N_a = Avogadro's constant
= 6.022169×10^{26}/kg mol = 2.73179×10^{26}/lb mol

R* = gas constant = 8.31432 J/mol K

R' = gas constant for dry air = 2.8704×10^2 J/kg K

M = molecular weight of dry air = 28.966 g/mol

E.2 Mean Free Path

The mean free path, L, is the mean value of the distance traveled by each neutral air particle in a selected air parcel, between successive collisions with other particles in that parcel. A meaningful average requires that the selected parcel be large enough to contain a substantial number of particles. The equation for L is given by

$$L = \left(\frac{\sqrt{2}}{2\pi}\right)\left(\frac{R^*T}{N_a\ C_d^{\ 2}\ P}\right) \quad , \tag{73}$$

where C_d is the effective collision diameter of the mean air molecules. The 1976 standard atmosphere value of 3.65×10^{-10} is valid for the range of altitudes in the RRA.

A computational form for moist air, using tabulated values, is

$$L = 2.335 \times 10^{-7}\ \frac{T}{P}\ \text{(meters)} \quad , \tag{74}$$

where T is the temperature in degrees Kelvin from table II and P is the pressure in millibars from table II.

A form of (73) to correct L for moist air is

$$L = \left(\frac{\sqrt{2}}{2\pi}\right)\frac{R'MT_v}{N_a\ C_d^{\ 2}} \quad . \tag{75}$$

The computational form for moist air is

$$L = 2.3325 \times 10^{-7}\ \frac{T_v}{P}\ \text{(meters)} \quad , \tag{76}$$

where T_v is the virtual temperature in degrees Kelvin from table III and P is the pressure in millibars from table II.

E.3. Mean Collision Frequency

The mean collision frequency, V_c, is considered to be the average speed of air particles contained in an air parcel, divided by the mean free path of the particles inside that parcel. Computationally this is equivalent to

$$V_c = \frac{V}{L}\ (\mathrm{sec}^{-1}) \quad . \tag{77}$$

To determine V_c for dry air, use V and L from equations (70) and (74). To determine V_c for moist air, use V and L from equations (72) and (76).

E.4. Speed of Sound

The expression for the speed of sound, C_s, in meters per second in dry air, is

$$C_s = \sqrt{\frac{\gamma R^* T}{M}} \quad . \tag{78}$$

To compute C_s for dry air from tabulated values, use

$$C_s = \sqrt{4.0185 \times 10^2 \times T} \quad \text{(meters per second)} \quad , \tag{79}$$

where T is the temperature in degrees Kelvin from table II. One form for the speed of sound in moist air is

$$C_s \approx \sqrt{\gamma R' T_v} \quad , \tag{80}$$

where T_v is the virtual temperature from table III. A computational form for moist air is

$$C_s \approx \sqrt{4.0185 \times 10^2\ T_v} \quad \text{(meters per second)} \quad . \tag{81}$$

E.5. Dynamic Coefficient of Viscosity

The coefficient of dynamic viscosity, μ, is defined as a coefficient of internal friction developed where gas regions move adjacent to each other at different velocities. The following expression is taken from the U.S. Standard Atmosphere (1976):

$$\mu = \frac{\beta \cdot T^{3/2}}{T + S} \quad . \tag{82}$$

The computational form is

$$\mu = \frac{(1.458 \times 10^{-6})\ T^{3/2}}{T + 110.4} \quad \begin{pmatrix}\text{kilograms per second} \\ \text{per meter}\end{pmatrix}, \tag{83}$$

where T is the temperature in degrees Kelvin from table II.

E.6. Kinematic Coefficient of Viscosity

The kinematic coefficient of viscosity, designated as η, is defined to be the ratio of the dynamic coefficient of viscosity of a gas to its density, or

$$\eta = \mu / \rho \quad . \tag{84}$$

The computational form is

$$\eta = 1.0 \times 10^{3}\ \mu/\rho \quad \begin{pmatrix}\text{square meters} \\ \text{per second}\end{pmatrix}, \tag{85}$$

where μ is the dynamic coefficient of viscosity from equation (83) and ρ is the density in grams per cubic meter from table II.

E.7. Coefficient of Thermal Conductivity

The empirical expression used for the coefficient of thermal conductivity, designated as K_t, is given in the 1976 Standard Atmosphere as

$$K_t = \frac{2.65019 \times 10^{-3} \cdot T^{3/2}}{T + 245.4 \times 10^{-(12/T)}} \quad \begin{pmatrix}\text{watts per meter} \\ \text{per degree Kelvin}\end{pmatrix}, \tag{86}$$

where T is in degrees Kelvin.

E.8. Refractive Modulus and Refractive Index

The refractive modulus or refractivity (Selby and McClatchey, 1975; Smith and Weintraub, 1953) is defined as N, where

$$N = (n - 1) \cdot 10^{6} \tag{87}$$

and n is the refractive index.

For microwave frequencies below approximately 30 GHz (equivalent to wavelengths above 1 cm), N, the refractive modulus, is given by the empirical equation

$$N = 77.6 \frac{P}{T_d} + 3.73 \times 10^5 \frac{e}{T^2} \text{ (dimensionless)}, \qquad (88)$$

where E and P are in millibars and T and T_d are in degrees Kelvin.

The following expression is valid for the visible and infrared wavelengths shorter than approximately 30 μm (0.03 mm).

$$N = 77.6 \frac{P}{T} + 0.584 \frac{P}{T\lambda} \text{ (dimensionless)}, \qquad (89)$$

where λ is the wavelength in microns and T is in degrees Kelvin.

The expression for N for the wavelength from 0.03 mm to 1 cm is an extremely complex function of wavelength.

CHAPTER IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This document satisfies the technical objectives established for the RRAC by the RCC MG. Upper air statistics and models for wind and thermodynamic quantities for the specific site have been derived in a consistent and uniform manner, which will be used in publications for all other assigned site locations. These RRAs represent an improvement over the previously published RRAs because of the availability of more extensive upper air data bases and the adaptation of more advanced statistical techniques. A statistical measure of central tendency (mean values) and a measure of dispersion (standard deviation with respect to the mean values) for monthly and annual reference periods have been tabulated for all variables in a consistent manner from data bases that have been edited and quality-controlled in the same manner. Further, a statistical measure for symmetry (skewness coefficient that involves the third statistical moment) has been tabulated for all variables except the U and V wind components. Even with these improvements, the user of these RRAs must recognize certain limitations of the statistical tabulations:

1) The wind profile structure with respect to altitude cannot be modeled from the RRA statistics because the interlevel and crosslevel correlations were not computed.

2) The profile structure with respect to altitude for any of the thermodynamic variables or any quantities derivable from these variables cannot be modeled because the prerequisite correlations were not computed. However, the profiles of monthly and annual means for pressure, virtual temperature, and density are in agreement (table IV) with the hydrostatic equation and the equation of state.

The preceding limitations are cited to prevent a misuse of the RRAs. More extensive statistical tabulations were beyond the scope of this committee's task. As greater insight is gained through usage of these RRAs, many adaptations of the statistical tabulations for specific engineering and scientific applications are envisioned.

Recommendations

It is recommended than the wind and thermodynamic statistical tabulations and attendant models contained in the RRAs be used as a standard reference source, as may be appropriate, by the ranges and range users. It is further recommended that the respective Range Staff Meteorologist or responsible agency staff member be consulted for the applicability of the RRAs for specific engineering applications.

REFERENCES

Buell, Eugene C.: "Statistical Relations in a Perfect Gas." Journal of Applied Meteorology, 9, 1970, pp. 729-731.

List, R. J., Editor: Acceleration of Gravity, Smithsonian Meteorological Tables, Sixth Ed. Smithsonian Institution, Washington, D.C., 1968, pp. 488.

Selby, J.E.A.; and McClatchey, R.A.: AFCRL-TR-75-0255, Atmospheric Transmittance from 0.25 to 28.5 μm - Computer Code Lowtran 3, Air Force Cambridge Research Laboratories. Available through the National Technical Information Service, Washington, D.C., 1975.

Smith, E.K.; and Weintraub, S.: "The Constants in the Equation for Atmospheric Refractive Index at Radio Frequencies," Proceedings of the Institute of Radio Engineers, 41, 8, August 1953, pp. 1035-1037.

Smith, O.E.: NASA TM X-73319, Vector Wind and Vector Wind Shear Models at 0-27 km Altitude for Cape Kennedy, Florida, and Vandenberg AFB, California. Prepared under sponsorship of the National Aeronautics and Space Administration. Available through the National Technical Information Service, Washington, D.C., July 1976.

U.S. Standard Atmosphere, 1976. Prepared under the sponsorship of the National Aeronautics and Space Administration, United States Air Force, and United States Weather Bureau. Available through U.S. Government Printing Office, Washington, D.C., October 1976.

PREVIOUS RANGE REFERENCE ATMOSPHERES PUBLISHED BY IRIG

Atlantic Missile Range Reference Atmosphere for Cape Kennedy, Florida (Part I), Document 104-63, April 16, 1963. (AD451780)

White Sands Missile Range Reference Atmosphere (Part I), Document 104-63, June 28, 1964. (AD451781)

Fort Churchill Missile Range Reference Atmosphere for Fort Churchill, Manitoba, Canada (Part I), Document 104-63, August 7, 1964. (AD634727)

Pacific Missile Range Reference Atmosphere for Eniwetok, Marshall Islands (Part I), Document 104-63, September 1, 1964. (AD479264)

Fort Greely Missile Range Reference Atmosphere (Part I), Document 104-63, October 6, 1964. (AD634726)

Eglin Gulf Test Range Atmosphere for Eglin AFB, Florida (Part I), Document 104-63, January 25, 1965. (AD472601)

Pacific Missile Range Atmosphere for Point Arguello, California (Part I), Document 104-63, April 1965. (AD472602)

Wallops Island Test Range Reference Atmosphere (Part I), Document 104-63, July 10, 1965. (AD474071)

Eastern Test Range Reference Atmosphere for Ascension Island, South Atlantic (Part I), Document 104-63, July 1966. (AD645591)

Johnston Island Test Site Reference Atmosphere (Part I), Document 104-63, January 1970. (AD782652)

Lihue, Kauai, Hawaii Reference Atmosphere (Part I), Document 104-63, January 1970. (AD782653).

Cape Kennedy, Florida Reference Atmosphere (Part II), Document 104-63, September 1971. (AD751581)

White Sands Missile Range Reference Atmosphere (Part II), Document 104-63, September 1971. (AD782654)

Wallops Island Test Range Reference Atmosphere (Part II), Document 104-63, September 1971. (ADA040280)

Fort Greely Missile Range Reference Atmosphere (Part II), Document 104-63, September 1971. (ADA040281

Edwards Air Force Base Reference Atmosphere (Part I), Document 104-63, September 1972. (AD782651)

Kwajalein Missile Range Reference Atmosphere for Kwajalein, Marshall Islands (Part I), Document 104-63, October 1974. (ADA002664)

Pacific Missile Test Center Reference Atmosphere for Point Arguello, California (Part II), Document 104-63, November 1975. (ADA040279)

REVISED RANGE REFERENCE ATMOSPHERES PUBLISHED BY THE RCC

Kwajalein Missile Range, Kwajalein, Marshall Islands, Range Reference Atmosphere, 0-70 Km Altitude, Document 360-82, December 1982. (AD123424)

Cape Canaveral, Florida, Range Reference Atmosphere, 0-70 Km Altitude, Document 361-83, February 1983. (ADA125553)

Vandenberg Air Force Base, California, Range Reference Atmosphere, 0-70 Km Altitude, Document 362-83, April 1983.

Dugway, Utah, Range Reference Atmosphere, 0-30 Km Altitude, Document 363-83, June 1983.

Wallops Island, Virginia, Range Reference Atmosphere, 0-70 Km Altitude, Document 364-83, July 1983.

White Sands Missile Range, New Mexico, Range Reference Atmosphere, 0-70 Km Altitude, Document 365-83, August 1983.

Edwards AFB, California, Range Reference Atmosphere, 0-70 Km Altitude, Document 366-83, August 1983.

Eglin AFB, Florida, Range Reference Atmosphere, 0-30 Km Altitude, Document 367-83, September 1983.

In addition to the documents above and the present RRA for Taquac, Guam Island, the revised series will include RRAs for the following locations:

Point Mugu, California
Barking Sands, Hawaii
Ascension Island, South Atlantic

CONVERSION UNITS

Physical Constants and Conversion Factors

Numerical values in this document are given in the International System of Units (SI, Système International d'Unités). The values in parentheses are equivalent U.S. Customary Units, which are English units adapted for use by the United States of America. The SI and U.S. Customary Units provided in table F are those normally used for measuring and reporting atmospheric data.

By definition, the following fundamental conversion factors are exact:

Type	U.S. Customary Units	Metric
Length	1 U.S. yard (yd)	0.9144 meter (m)
Mass	1 avoirdupois pound (lb)	453.59237 gram (g)
Time	1 second (s)	1 second (s)
Temperature	1 degree Rankine (°R)	9/5 degree Kelvin (K)

To aid in the conversion of units, conversion factors based on the above fundamental conversion factors are given in table F.

TABLE F. FACTORS FOR CONVERSION UNITS

Type of Data	METRIC Unit	METRIC Abbreviation	U. S. CUSTOMARY Unit	U. S. CUSTOMARY Abbreviation	CONVERSION Multiply	CONVERSION By	CONVERSION To Get
TEMPERATURE							
Ambient Temperature	degree Celsius	°C	degree Fahrenheit	°F	°F - 32	0.5556	°C
	degree Kelvin	K	degree Rankine	°R	°C	1.8*	°F - 32
					°R	1.00*	°F + 459.67
					°R - 459.67	1.00*	°F
					K	1.00*	°C + 273.15
					K - 273.15	1.00*	°C
Temperature Change	degree Celsius	°C	degree Fahrenheit	°F	°C or K	1.8*	temp. change °F or °R
	degree Kelvin	K	degree Rankine	°R	°F or °R	0.5556	temp. change °C or K
DENSITY							
Water Vapor Vapor Concentration (Absolute Humidity) and Ambient Density	gram per cubic meter	$g\ m^{-3}$	gram per cubic foot	$gr\ ft^{-3}$	$g\ m^{-3}$	0.43700	$gr\ ft^{-3}$
	gram per cubic centimeter	$g\ cm^{-3}$			$gr\ ft^{-3}$	2.2883	$g\ m^{-3}$
					$g\ m^{-3}$	10^{-6}*	$g\ cm^{-3}$
					$g\ cm^{-3}$	4.370×10^{5}	$gr\ ft^{-3}$
					$gr\ ft^{-3}$	2.288×10^{-6}	$g\ cm^{-3}$
WIND							
Windspeed	meter per second	$m\ s^{-1}$	mile per hour	mph	$m\ s^{-1}$	2.2369	mph
			knots	knots	mph	0.44704*	$m\ s^{-1}$
			feet per second	$ft\ s^{-1}$	$m\ s^{-1}$	1.9438	knots
					knots	0.51444	$m\ s^{-1}$
					mph	0.868976	knots
					knots	1.15078	mph
					$m\ s^{-1}$	3.2808	$ft\ s^{-1}$
					$ft\ s^{-1}$	0.3048*	$m\ s^{-1}$
DISTANCE							
Length	meter	m	feet	ft	m	3.2808	ft
	micron	μ	inch	in.	ft	0.3048*	m
	Angstrom unit	Å			in.	$2.54 \times 10^{+4}$*	μ
					in.	$2.54 \times 10^{+8}$*	Å
					m	10^{+6}	μ
					m	10^{+10}	Å

* Defined exact conversion factor

TABLE F. (continued)

Type of Data	METRIC Unit	METRIC Abbreviation	U. S. CUSTOMARY Unit	U. S. CUSTOMARY Abbreviation	CONVERSION Multiply	CONVERSION By	CONVERSION To Get
DISTANCE (Concluded)					μ	10^{-6}*	m
					μ	3.937×10^{-5}	in.
					Å	10^{-10}*	m
					Å	3.937×10^{-9}	in.
MASS							
Weight	gram	g	grain	gr	lb	0.45359237*	kg
	kilogram	kg	pound	lb	lb	453.59237*	g
					kg	2.20462	lb
					g	15.4324	gr
					gr	0.06480	g
PRESSURE							
Atmospheric	newton per square meter	newton m^{-2}	pound force per square inch	lb $in.^{-2}$	mb	10^{-3}*	bar
					bar	10^{3}*	mb
	millimeter of Mercury	mmHg	inch of Mercury	in.Hg	newton m^{-2}	10^{-2}*	mb
					newton m^{-2}	1.4504×10^{-4}	lb $in.^{-2}$
					lb $in.^{-2}$	6.8948×10^{3}	newton m^{-2}
	bar	bar			mb	1.4504×10^{-2}	lb $in.^{-2}$
	millibar	mb			lb $in.^{-2}$	68.948	mb
	dyne per square centimeter (microbar)	dyne cm^{-2}			mb	10^{3}*	dyne cm^{-2}
					dyne cm^{-2}	10^{-3}*	mb
	kilogram force per square meter	kg m^{-2}			lb $in.^{-2}$	6.8948×10^{4}	dyne cm^{-2}
					dyne cm^{-2}	1.4504×10^{-5}	lb $in.^{-2}$
					mb	10.1972	kg m^{-2}
					kg m^{-2}	0.0980665	mb
					lb $in.^{-2}$	703.0696	kg m^{-2}
					kg m^{-2}	0.0014223	lb $in.^{-2}$
					mb	2.9530×10^{-2}	in.Hg (32°F)
					mb	0.75006	mmHg (0°C)
					in.Hg (32°F)	25.40*	mmHg (0°C)
					mmHg (0°C)	1.33322	mb
					in.Hg (32°F)	33.8639	mb
	pascal	Pa			Pa	1.00*	newton m^{-2}

* Defined exact conversion factor

TABLE 1. 1 WIND STATISTICAL PARAMETERS. JANUARY
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.35	1.95	.1641	-1.19	1.82	4.93	1.81	-.12	375.
1.000	-9.18	4.80	.2627	-1.44	4.16	10.53	3.95	.05	420.
2.000	-7.40	5.25	.2293	-.66	3.69	8.96	4.02	.27	422.
3.000	-6.34	5.60	.2652	-.10	3.80	8.40	3.93	.33	422.
4.000	-5.89	5.52	.2211	.63	3.94	8.11	3.89	.47	422.
5.000	-5.80	5.29	.0429	.71	4.08	8.03	3.77	.46	423.
6.000	-5.62	5.29	-.0017	1.05	4.61	8.19	3.83	.39	422.
7.000	-4.69	5.14	-.0044	.92	4.45	7.53	3.51	.62	421.
8.000	-3.65	5.27	-.0630	.57	4.29	6.84	3.60	.77	419.
9.000	-2.40	5.08	-.1159	.42	4.45	6.29	3.45	.85	418.
10.000	-1.43	5.14	-.1119	.79	4.51	6.12	3.45	.99	416.
11.000	-.71	5.47	-.0485	1.59	5.12	6.70	3.75	.88	416.
12.000	-.70	5.44	-.0569	2.87	5.40	7.25	3.84	.98	413.
13.000	-1.12	5.71	-.0451	4.11	5.60	8.11	4.16	.92	413.
14.000	-2.26	5.76	-.1055	5.27	6.20	9.12	4.61	.60	413.
15.000	-4.42	5.87	-.2696	6.09	6.78	10.41	5.36	.52	408.
16.000	-7.10	6.01	-.4467	5.38	5.82	10.68	5.94	.65	392.
17.000	-8.11	5.38	-.4980	4.15	4.89	10.26	5.52	.54	349.
18.000	-6.84	4.36	-.2212	1.62	3.13	7.97	3.83	.25	350.
19.000	-5.29	4.71	-.0988	.29	2.42	6.56	3.62	.42	342.
20.000	-4.10	5.63	.0171	.12	1.99	6.13	3.84	.67	341.
21.000	-3.93	6.82	-.1332	.16	2.15	6.78	4.54	.63	327.
22.000	-4.40	7.85	-.1116	.24	2.07	7.86	4.84	.66	320.
23.000	-4.80	8.85	-.0687	.17	2.31	9.10	4.88	.84	316.
24.000	-5.30	9.53	-.0234	.14	2.45	9.85	5.25	.81	314.
25.000	-4.84	10.35	-.0388	-.02	2.61	10.09	5.94	.85	308.
26.000	-4.34	11.05	-.0014	.00	2.99	10.34	6.54	.93	297.
27.000	-3.34	12.40	.0460	.10	3.19	11.19	7.03	1.13	276.
28.000	-1.93	13.49	.0740	.41	3.61	12.33	6.91	1.06	255.
29.000	-.85	14.03	.1355	.57	3.64	13.07	6.29	.65	229.
30.000	-.25	15.14	.1063	.86	3.77	14.07	6.70	.81	169.

TABLE I. 2 WIND STATISTICAL PARAMETERS. FEBRUARY
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.40	1.78	.1371	-1.25	1.81	4.97	1.62	.04	341.
1.000	-9.41	3.91	.2362	-1.42	3.75	10.45	3.27	-.17	383.
2.000	-7.21	4.15	.2816	-1.09	3.75	8.47	3.55	.23	384.
3.000	-4.98	4.16	.1451	-.65	4.01	6.89	3.34	.89	384.
4.000	-4.09	4.03	.1359	-.55	3.90	6.22	3.13	.78	383.
5.000	-4.10	4.13	.0262	-.74	4.63	6.69	3.31	.56	383.
6.000	-3.62	4.78	.0099	-.61	5.10	6.92	3.80	.76	382.
7.000	-3.25	4.78	-.0925	-.88	5.66	7.27	3.66	.65	377.
8.000	-2.15	4.99	-.2446	-1.33	5.64	7.07	3.62	.81	372.
9.000	-.40	5.22	-.3114	-1.41	5.29	6.57	3.76	1.20	372.
10.000	.91	5.58	-.1968	-.64	4.99	6.65	3.58	1.28	369.
11.000	1.89	6.15	-.1176	.83	4.83	7.20	3.68	.77	369.
12.000	2.36	6.29	-.0869	3.00	5.38	8.12	4.12	.69	367.
13.000	2.34	6.55	-.1273	4.59	5.90	9.07	4.67	.67	361.
14.000	1.50	6.72	-.2161	6.05	6.26	9.84	5.11	.61	360.
15.000	-.24	7.00	-.3586	5.63	5.91	9.61	4.81	.44	355.
16.000	-2.97	6.99	-.5212	4.13	5.86	8.95	5.36	.89	344.
17.000	-4.24	6.04	-.4761	2.53	4.85	7.81	4.83	.90	328.
18.000	-3.79	4.48	-.2077	.52	3.09	5.86	3.14	.84	330.
19.000	-2.79	4.42	-.0690	-.18	2.76	5.09	3.01	1.00	325.
20.000	-2.29	5.11	-.0450	-.23	2.68	5.22	3.35	1.04	322.
21.000	-2.76	6.25	-.0027	.03	2.47	6.04	4.03	.96	309.
22.000	-3.52	7.28	-.0759	-.03	2.21	7.16	4.35	.98	306.
23.000	-4.24	8.66	-.1078	-.18	2.22	8.64	4.81	.63	300.
24.000	-4.98	9.70	-.1236	-.18	2.29	9.88	5.13	.28	303.
25.000	-5.13	10.71	-.0616	-.08	2.32	10.74	5.55	.31	297.
26.000	-5.22	12.04	.0243	-.13	2.86	11.68	6.60	.29	283.
27.000	-4.93	13.49	.0569	.01	3.43	12.99	6.98	.16	257.
28.000	-4.25	14.79	.1183	.15	3.95	14.42	6.60	.03	242.
29.000	-3.02	15.60	.1304	.25	4.24	14.95	6.80	.17	218.
30.000	-2.54	16.37	.0781	.35	4.33	15.23	7.74	.34	172.

TABLE I. 3 WIND STATISTICAL PARAMETERS, MARCH
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.78	1.84	.0267	-1.23	1.64	5.22	1.78	.31	376.
1.000	-9.71	3.45	.0458	-1.59	3.18	10.42	3.20	.37	424.
2.000	-7.13	3.82	.1743	-1.04	2.84	7.98	3.30	.10	424.
3.000	-5.55	3.96	.2169	-.75	3.26	6.90	3.17	.42	424.
4.000	-4.35	3.88	.1221	-.71	3.67	6.17	3.13	.61	424.
5.000	-3.74	4.23	.0927	-.71	4.08	6.25	3.16	.58	424.
6.000	-3.31	4.76	.0870	-.59	4.68	6.06	3.38	.67	422.
7.000	-2.48	5.15	-.0609	-1.05	4.78	6.80	3.21	.58	421.
8.000	-1.36	5.48	-.2024	-1.07	4.66	6.63	3.27	.57	417.
9.000	.04	5.75	-.1912	-.65	4.41	6.30	3.62	.71	415.
10.000	1.13	5.94	-.1721	-.07	4.40	6.43	3.81	.71	411.
11.000	1.97	6.42	-.1545	1.09	4.83	7.18	4.22	.72	409.
12.000	2.60	6.58	-.1197	2.74	5.36	8.09	4.55	.83	407.
13.000	2.41	6.58	-.1531	3.94	5.62	8.52	4.85	1.05	405.
14.000	1.71	6.73	-.1943	3.96	5.74	8.45	5.03	1.11	403.
15.000	-.06	6.92	-.3942	3.11	5.68	7.97	5.12	.98	401.
16.000	-2.99	6.93	-.4484	2.76	5.43	8.30	5.00	1.16	399.
17.000	-3.95	6.36	-.3616	1.76	4.27	7.70	4.24	1.02	371.
18.000	-3.18	4.54	-.1296	.44	2.81	5.49	2.93	.56	371.
19.000	-1.87	4.22	-.0860	-.30	2.44	4.62	2.43	.50	367.
20.000	-1.17	4.79	-.0930	-.31	2.47	4.95	2.44	.42	362.
21.000	-1.65	5.79	-.0661	.07	2.57	5.52	3.51	.96	359.
22.000	-2.90	6.96	-.0892	.15	2.20	6.51	4.39	.85	357.
23.000	-3.91	8.33	-.0691	-.10	2.18	7.97	5.08	.80	350.
24.000	-4.57	9.22	-.1333	-.22	2.46	9.16	5.28	.55	346.
25.000	-5.38	10.02	-.1025	-.31	2.40	10.05	5.83	.46	343.
26.000	-5.73	11.07	-.0563	-.43	2.76	10.86	6.70	.41	339.
27.000	-5.95	12.11	-.0937	-.42	3.25	11.69	7.47	.41	323.
28.000	-5.64	12.79	-.0212	-.43	3.73	12.32	7.57	.46	304.
29.000	-6.02	13.09	.0005	-.35	4.08	13.00	7.41	.43	284.
30.000	-5.76	12.93	-.0116	.06	4.46	13.11	6.93	.57	224.

TABLE I. 4 WIND STATISTICAL PARAMETERS, APRIL
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-5.48	1.84	.0432	-.96	1.33	5.76	1.72	.05	346.
1.000	-10.62	2.95	.0509	-.51	2.26	10.93	2.70	-.56	405.
2.000	-8.61	3.36	.1233	-.63	2.41	9.05	3.10	-.03	405.
3.000	-6.90	3.80	.2016	-.70	2.74	7.73	3.21	.02	405.
4.000	-6.13	3.70	.2195	-.90	2.82	7.16	2.96	.26	405.
5.000	-5.98	3.88	.1894	-1.25	2.88	7.07	3.27	.49	405.
6.000	-5.38	4.87	.2244	-1.32	3.48	7.34	3.56	.39	405.
7.000	-4.12	5.61	.1044	-1.49	3.93	7.25	3.67	.69	403.
8.000	-1.88	6.45	.0670	-1.38	4.31	7.22	3.66	.65	403.
9.000	1.42	7.05	.1573	-1.33	4.74	7.57	4.30	.67	402.
10.000	4.07	7.49	.1778	-.93	5.09	8.64	4.96	.62	402.
11.000	6.04	8.02	.1376	.10	6.17	10.35	5.63	.55	401.
12.000	7.18	8.52	.1167	1.34	6.91	11.67	6.12	.50	398.
13.000	7.26	8.73	.0649	1.39	6.52	11.65	6.12	.59	397.
14.000	6.44	8.39	.0046	.37	5.60	10.48	5.79	.62	395.
15.000	4.02	7.59	-.0659	-1.02	4.86	8.68	4.79	.83	394.
16.000	.03	6.21	-.1108	-1.36	3.95	6.46	3.77	.78	386.
17.000	-2.71	4.93	-.1377	-1.49	3.51	5.97	3.23	.81	360.
18.000	-4.80	4.24	-.0581	-1.33	3.12	6.31	3.56	.84	364.
19.000	-4.42	4.11	-.0297	-.93	2.46	5.83	3.05	.61	358.
20.000	-3.79	4.94	.0174	-.53	2.32	5.97	2.96	.47	354.
21.000	-4.06	6.25	.0708	-.25	2.16	6.71	3.89	.67	346.
22.000	-5.41	7.49	-.0703	-.13	2.08	8.24	4.66	.63	343.
23.000	-6.79	8.53	-.0915	-.08	2.25	9.60	5.62	.40	336.
24.000	-7.84	9.18	.0325	-.06	2.37	10.52	6.36	.31	331.
25.000	-9.16	9.65	.1038	-.07	2.47	11.32	7.41	.25	320.
26.000	-10.14	10.27	.0807	.26	2.70	12.21	8.15	.26	307.
27.000	-10.95	10.80	.0644	.34	3.14	13.17	8.53	.21	291.
28.000	-11.52	10.61	.0910	.36	3.34	13.90	7.94	.24	274.
29.000	-11.88	10.56	.0984	.59	3.55	14.45	7.52	.26	250.
30.000	-12.79	11.08	.1472	.49	3.83	15.58	7.62	.31	190.

TABLE 1. 5 WIND STATISTICAL PARAMETERS, MAY

STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.11	2.44	.3371	.00	1.87	4.76	1.91	.20	368.
1.000	-7.08	4.63	.2932	.43	2.95	8.18	3.66	.42	415.
2.000	-5.36	4.12	.2162	.46	2.72	6.54	3.26	.89	416.
3.000	-4.49	4.31	.1133	.24	2.99	6.16	3.12	.89	414.
4.000	-3.83	3.66	.1016	-.23	2.94	5.40	3.02	1.07	411.
5.000	-3.36	4.07	.1562	-.49	2.93	5.22	3.04	1.17	411.
6.000	-3.05	4.11	.1410	-.71	3.24	5.30	3.01	1.02	408.
7.000	-2.11	4.69	-.0700	-.98	3.41	5.44	3.07	.66	403.
8.000	-.65	5.56	-.0050	-1.62	3.48	5.89	3.36	.66	406.
9.000	1.49	6.87	.1004	-1.89	4.29	7.31	4.21	.77	406.
10.000	3.53	8.50	.1936	-1.58	4.94	9.16	5.24	.79	405.
11.000	5.34	9.93	.2659	-1.07	6.33	11.37	6.34	.68	403.
12.000	6.14	11.39	.3486	-.74	7.13	13.05	6.95	.54	401.
13.000	6.15	12.04	.3472	-1.33	7.07	13.56	7.08	.53	399.
14.000	5.17	11.50	.3208	-2.08	6.41	12.60	6.75	.66	399.
15.000	2.37	9.81	.2810	-2.91	5.21	10.35	5.49	.59	390.
16.000	-1.48	7.54	.2384	-3.50	3.82	8.33	4.05	.48	388.
17.000	-4.19	6.20	.0770	-3.21	3.08	7.90	3.66	.37	346.
18.000	-6.05	4.48	-.0568	-2.21	2.56	7.57	3.30	.15	348.
19.000	-7.01	3.82	-.0477	-1.25	2.36	7.74	3.30	.18	347.
20.000	-8.14	4.29	-.0143	-.34	2.06	8.56	3.95	.40	343.
21.000	-9.36	5.26	.0209	-.21	2.06	9.78	4.88	.28	335.
22.000	-10.31	5.69	-.0541	-.11	2.22	11.25	5.47	.11	333.
23.000	-12.41	6.43	-.0060	-.09	2.40	12.76	6.21	.09	325.
24.000	-13.67	7.35	-.0046	-.14	2.55	14.08	7.02	.08	321.
25.000	-15.44	7.69	-.0919	-.08	2.31	15.69	7.53	.23	316.
26.000	-16.93	7.91	-.1056	-.37	2.59	17.19	7.77	.13	307.
27.000	-18.31	7.91	-.0623	-.22	2.74	18.58	7.76	.07	289.
28.000	-18.87	8.26	-.0665	.00	3.02	3.19	8.07	.06	265.
29.000	-18.77	8.45	-.0806	.19	3.43	19.19	8.20	.22	237.
30.000	-18.74	8.42	-.0475	.10	3.21	19.05	8.32	.31	179.

TABLE 1. 6 WIND STATISTICAL PARAMETERS, JUNE

STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.02	1.89	.1266	.23	1.43	4.37	1.64	.11	378.
1.000	-7.57	3.49	.0713	1.18	2.59	8.34	2.83	-.03	411.
2.000	-6.33	3.06	.1299	.65	2.55	7.08	2.49	.32	413.
3.000	-6.40	3.12	.1272	.69	2.73	7.16	2.70	.40	413.
4.000	-5.86	3.08	.0899	.15	2.88	6.64	2.84	.24	413.
5.000	-5.53	3.28	.1151	-.11	2.78	6.41	2.82	.22	413.
6.000	-5.20	3.58	.1133	-.26	3.20	6.42	2.99	.22	412.
7.000	-4.36	3.93	.1697	-.22	3.51	6.22	2.85	.27	411.
8.000	-3.39	4.80	.1619	-.27	4.20	6.46	3.23	.50	407.
9.000	-2.07	6.00	.2556	-.50	5.23	7.20	3.99	.62	406.
10.000	-.79	6.94	.2842	-.38	6.29	8.23	4.53	.72	406.
11.000	.16	8.23	.2923	-.23	7.29	9.68	5.19	.52	405.
12.000	1.17	9.67	.2914	-.75	8.37	11.38	5.97	.46	403.
13.000	1.57	10.70	.2837	-1.36	9.19	12.67	6.52	.46	403.
14.000	1.43	10.92	.2871	-2.01	9.38	12.79	7.01	.60	403.
15.000	-.30	10.30	.3357	-2.68	7.24	11.13	6.46	.87	393.
16.000	-4.35	7.66	.2882	-2.59	4.68	8.74	5.49	1.23	377.
17.000	-7.20	5.41	.2298	-2.29	3.10	8.60	4.69	.89	357.
18.000	-9.83	3.68	.1281	-1.63	2.24	10.25	3.56	.25	358.
19.000	-11.43	3.73	-.0262	-1.22	1.93	11.68	3.66	.38	356.
20.000	-12.91	4.02	.1113	-.56	2.05	13.10	3.98	.41	350.
21.000	-14.53	4.89	.0181	-.20	2.18	14.71	4.84	.26	343.
22.000	-16.22	5.72	-.0575	-.08	2.07	16.37	5.67	.27	330.
23.000	-17.66	6.45	-.0626	-.17	2.35	17.83	6.40	.19	324.
24.000	-19.12	6.77	-.1109	-.24	2.57	19.31	6.72	.07	318.
25.000	-20.48	7.11	-.0694	-.02	2.26	20.62	7.05	.00	323.
26.000	-21.74	7.38	-.0861	-.08	2.43	21.90	7.30	-.10	308.
27.000	-23.09	7.34	-.1027	.03	2.59	23.26	7.26	-.27	287.
28.000	-24.10	7.67	-.0168	.04	2.97	24.30	7.60	-.16	264.
29.000	-24.90	7.70	-.0384	-.06	3.03	25.10	7.67	-.07	232.
30.000	-25.53	7.63	-.0839	-.06	3.45	25.79	7.52	-.03	178.

TABLE I. 7 WIND STATISTICAL PARAMETERS, JULY

STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-2.32	2.32	.0909	.57	1.74	3.38	1.63	.54	409.
1.000	-4.44	5.04	.0968	1.61	3.42	6.76	3.69	.80	423.
2.000	-4.02	4.54	.2503	1.37	3.20	6.19	3.23	.82	425.
3.000	-4.43	4.53	.2333	1.39	3.35	6.53	3.25	.48	425.
4.000	-4.22	4.64	.3016	1.34	3.60	6.58	3.27	.61	427.
5.000	-4.16	4.59	.3254	1.11	3.92	6.64	3.30	.58	427.
6.000	-4.00	4.51	.2925	.78	3.88	6.36	3.40	.74	424.
7.000	-3.81	4.22	.2885	.21	3.71	5.96	3.26	.67	421.
8.000	-3.54	4.25	.2302	-.25	3.87	5.93	3.23	.59	421.
9.000	-3.34	4.86	.1717	-.61	4.23	6.39	3.50	.83	421.
10.000	-3.17	5.44	.1650	-1.05	4.87	6.96	3.99	1.17	419.
11.000	-3.22	6.58	.1644	-1.66	5.68	8.11	4.77	1.21	415.
12.000	-3.30	7.96	.1787	-2.95	6.79	9.88	5.60	.91	415.
13.000	-3.80	8.84	.1646	-4.29	7.84	11.44	6.43	.99	409.
14.000	-4.71	9.42	.1341	-5.23	8.35	12.60	7.01	.74	405.
15.000	-6.70	8.69	.2663	-4.99	7.14	12.21	6.85	.65	396.
16.000	-9.27	6.42	.2897	-3.74	4.42	11.40	5.53	.41	378.
17.000	-11.59	4.25	.2537	-2.60	2.67	12.20	4.20	-.16	358.
18.000	-14.05	3.15	.0734	-1.43	2.26	14.31	3.13	.26	359.
19.000	-15.71	3.42	.0337	-1.01	2.20	15.90	3.41	.34	353.
20.000	-16.92	3.88	-.0077	-.39	2.11	17.06	3.84	.16	346.
21.000	-18.15	4.82	.0456	-.24	2.45	18.33	4.76	.26	336.
22.000	-19.48	5.78	-.0058	-.07	2.22	19.63	5.68	.22	313.
23.000	-20.86	6.65	-.0268	-.02	2.41	21.03	6.55	.18	303.
24.000	-22.15	7.14	-.0839	-.23	2.57	22.32	7.08	.09	295.
25.000	-23.99	7.14	-.0712	-.09	2.19	24.09	7.12	-.13	298.
26.000	-25.31	7.17	-.0499	.01	2.38	25.43	7.14	-.30	286.
27.000	-26.72	7.00	-.0883	.02	2.77	26.87	6.94	-.15	266.
28.000	-27.96	7.32	-.0878	.16	3.14	28.15	7.27	-.12	246.
29.000	-29.38	7.79	-.0372	.17	2.83	29.54	7.73	-.14	210.
30.000	-30.18	7.28	-.0657	.41	3.08	30.35	7.23	-.21	145.

TABLE I. 8 WIND STATISTICAL PARAMETERS, AUGUST

STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-1.40	2.81	.2512	.80	1.98	3.35	1.78	.95	398.
1.000	-2.08	6.71	.3023	2.13	4.41	7.23	4.57	1.65	422.
2.000	-2.18	6.38	.3228	1.82	4.29	6.88	4.45	1.91	425.
3.000	-2.85	5.93	.2657	1.77	4.28	6.96	4.04	1.34	424.
4.000	-3.06	5.36	.2616	1.75	4.54	6.84	3.85	1.54	425.
5.000	-3.03	5.43	.2671	1.58	4.80	6.88	4.09	1.64	425.
6.000	-3.01	5.29	.1971	1.18	4.67	6.66	3.99	1.26	425.
7.000	-2.87	5.20	.1933	.72	4.13	6.30	3.61	.93	422.
8.000	-2.66	5.33	.2211	.39	4.24	6.37	3.59	.99	423.
9.000	-2.59	5.66	.2351	-.19	4.59	6.81	3.66	.72	422.
10.000	-2.64	6.25	.2686	-.98	4.93	7.53	3.82	.50	421.
11.000	-2.66	7.30	.3018	-1.79	5.94	8.73	4.75	.82	418.
12.000	-2.87	8.17	.2994	-3.28	7.31	10.23	5.86	.89	417.
13.000	-3.02	9.05	.2964	-4.90	8.80	12.04	6.87	.88	417.
14.000	-3.72	9.84	.3106	-6.13	9.56	13.61	7.36	.74	415.
15.000	-5.90	9.77	.2902	-5.93	8.24	13.49	7.14	.59	409.
16.000	-8.94	6.98	.2070	-3.96	4.91	11.41	6.17	.46	392.
17.000	-11.50	4.77	.2633	-2.58	2.87	12.15	4.71	.41	360.
18.000	-14.29	3.82	.0601	-1.27	2.22	14.53	3.79	.22	359.
19.000	-15.80	3.80	.0760	-.76	2.25	15.97	3.79	.31	352.
20.000	-16.99	4.41	.0150	-.53	2.28	17.15	4.39	.50	345.
21.000	-18.71	5.09	-.0544	-.23	2.22	18.85	5.06	.27	334.
22.000	-19.98	5.93	-.0426	.00	2.30	20.13	5.88	.32	318.
23.000	-21.09	6.48	-.0232	.07	2.47	21.27	6.39	.11	309.
24.000	-22.21	6.72	-.1371	.09	2.63	22.39	6.63	-.03	304.
25.000	-23.78	6.69	-.0738	-.06	2.36	23.91	6.64	-.03	268.
26.000	-25.14	6.84	-.1852	-.11	2.57	25.29	6.79	-.05	277.
27.000	-26.70	6.86	-.1502	.08	2.89	26.87	6.79	-.16	254.
28.000	-27.72	7.43	.0552	.27	3.01	27.91	7.32	-.49	229.
29.000	-28.59	7.65	.0074	.37	3.12	28.79	7.52	-.60	196.
30.000	-30.29	7.82	.0042	.16	3.31	30.49	7.76	-.22	140.

TABLE 1. 9 WIND STATISTICAL PARAMETERS. SEPTEMBER
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-1.47	2.83	.1470	.30	1.87	3.26	1.78	.59	389.
1.000	-2.78	6.25	.1788	1.04	3.98	6.90	4.01	1.21	407.
2.000	-3.03	5.77	.2384	.90	3.64	6.41	3.91	1.71	408.
3.000	-3.78	5.57	.2117	.89	3.60	6.79	3.68	1.02	408.
4.000	-3.95	5.68	.2221	.89	3.89	7.02	3.79	.95	409.
5.000	-3.91	5.70	.2985	.80	3.32	6.96	3.91	1.24	409.
6.000	-3.96	5.54	.3450	.63	4.03	6.91	3.90	1.05	408.
7.000	-3.57	5.15	.3292	.37	4.00	6.50	3.61	1.15	408.
8.000	-3.25	5.21	.2391	.12	4.18	6.46	3.66	1.10	408.
9.000	-2.74	5.27	.1562	-.16	4.82	6.63	3.81	1.14	406.
10.000	-2.33	5.62	.1557	-.52	5.20	7.04	3.84	.98	406.
11.000	-2.00	6.45	.1167	-.77	6.12	8.00	4.41	.83	405.
12.000	-1.83	7.40	.0248	-1.33	7.12	9.32	4.88	.83	404.
13.000	-1.81	8.44	-.0249	-1.86	7.89	10.60	5.24	.65	398.
14.000	-2.61	9.08	.0170	-2.42	8.12	11.27	5.83	.71	397.
15.000	-5.09	8.68	.1344	-2.74	6.92	10.69	6.49	1.25	390.
16.000	-8.34	6.51	.1489	-2.26	4.15	9.98	5.88	1.06	364.
17.000	-10.42	4.29	.0699	-1.46	2.70	10.90	4.18	.50	335.
18.000	-12.06	3.27	.0412	-.69	2.26	12.30	3.24	.12	334.
19.000	-13.32	3.72	.0677	-.47	2.06	13.50	3.69	.25	329.
20.000	-14.44	4.42	.0268	-.20	2.06	14.60	4.38	.18	324.
21.000	-15.98	5.14	-.0022	-.02	2.22	16.14	5.12	.07	316.
22.000	-17.68	5.87	-.0727	.23	2.12	17.83	5.82	.12	309.
23.000	-19.03	6.18	-.0761	.28	2.31	19.19	6.13	.07	303.
24.000	-20.23	6.47	-.0902	.13	2.57	20.42	6.38	.11	297.
25.000	-21.96	7.03	.0244	.02	2.19	22.08	6.99	.10	291.
26.000	-22.91	7.42	.0279	.00	2.64	23.10	7.32	-.22	275.
27.000	-24.56	8.06	.0322	-.08	2.82	24.75	7.96	-.40	257.
28.000	-25.88	8.21	.0723	.31	2.83	26.08	8.06	-.60	238.
29.000	-26.57	8.44	.1138	.78	2.[illegible]	26.78	8.31	-.60	216.
30.000	-27.93	8.84	.0134	.46	3.55	28.21	8.71	-.55	145.

TABLE 1. 10 WIND STATISTICAL PARAMETERS. OCTOBER
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-2.94	2.78	.1680	.22	1.98	4.05	1.98	2.08	380.
1.000	-6.00	6.24	.0698	1.26	4.24	8.72	4.29	.83	417.
2.000	-5.48	5.68	.0623	1.02	3.85	7.89	3.99	1.07	418.
3.000	-5.88	5.71	.0727	1.08	4.19	8.25	4.21	.95	418.
4.000	-5.89	5.79	.0655	.76	4.37	8.24	4.47	.88	419.
5.000	-5.91	5.92	.0570	.55	4.58	8.40	4.55	.89	419.
6.000	-5.78	5.90	.0797	.48	4.56	8.37	4.38	.78	418.
7.000	-5.05	5.91	.1575	.31	4.67	7.89	4.46	.95	417.
8.000	-4.19	6.02	.1740	.12	4.64	7.56	4.26	.83	414.
9.000	-2.88	6.39	.1721	.32	5.24	7.68	4.20	.97	413.
10.000	-1.76	6.89	.1685	.52	6.11	8.34	4.30	.81	410.
11.000	-.87	8.06	.1906	.40	7.28	9.54	5.28	.79	410.
12.000	.04	8.82	.1530	.09	8.11	10.52	5.72	.90	409.
13.000	.03	9.41	.0987	-.61	8.44	11.05	6.15	.99	408.
14.000	-1.12	9.16	.0963	-1.56	8.22	10.71	6.33	1.03	406.
15.000	-4.61	8.49	.1118	-2.68	6.77	10.17	6.53	1.16	400.
16.000	-8.36	7.07	-.0103	-2.56	5.20	10.66	6.32	.91	369.
17.000	-9.89	5.31	.0212	-2.17	3.64	10.83	5.17	.66	320.
18.000	-10.36	4.26	.0006	-.98	2.44	10.74	4.15	.30	318.
19.000	-10.38	4.55	-.1178	-.44	2.26	10.72	4.34	.12	310.
20.000	-11.61	5.14	-.0969	-.13	2.15	11.86	5.03	.20	303.
21.000	-13.08	6.09	-.0947	.15	2.03	13.30	5.95	.18	293.
22.000	-14.48	6.62	.0159	.32	2.29	14.76	6.40	.07	288.
23.000	-15.63	7.25	-.1272	.01	2.07	15.89	6.96	.03	279.
24.000	-16.69	8.11	-.1095	-.09	2.51	17.05	7.73	.16	277.
25.000	-17.81	8.77	-.0855	-.02	2.14	18.09	8.44	.14	266.
26.000	-18.62	9.40	-.1153	.13	2.68	19.00	9.01	-.01	254.
27.000	-19.26	9.55	-.2064	.37	3.03	19.67	9.19	-.20	236.
28.000	-18.87	9.65	-.2580	.71	3.30	19.41	9.17	-.08	212.
29.000	-17.77	9.72	-.1398	.76	3.77	18.51	9.07	.08	174.
30.000	-17.39	10.55	-.0751	.42	3.60	18.21	9.76	.23	124.

TABLE I. 11 WIND STATISTICAL PARAMETERS, NOVEMBER
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.29	2.68	.0534	-.44	2.05	5.13	1.93	.11	377.
1.000	-9.04	5.85	.1379	.34	4.91	11.09	4.14	.54	406.
2.000	-7.83	5.60	.1312	.75	4.59	9.84	4.18	.73	407.
3.000	-8.13	5.34	.1502	.66	4.48	9.95	4.00	.50	407.
4.000	-7.79	5.29	.1666	.72	4.59	9.67	4.08	.42	407.
5.000	-8.11	5.64	.0656	.66	4.81	10.03	4.53	.28	407.
6.000	-8.38	6.10	-.0747	.67	5.17	10.45	5.04	.39	406.
7.000	-7.76	6.07	-.1404	.34	4.98	9.87	4.95	.43	405.
8.000	-6.88	6.18	-.1288	.20	4.78	9.21	4.83	.61	402.
9.000	-5.86	6.90	.0465	-.07	5.03	9.04	5.04	.85	402.
10.000	-4.74	7.63	.1282	.17	5.41	9.24	4.94	.72	400.
11.000	-3.63	8.31	.2232	.37	5.96	9.65	4.95	.59	398.
12.000	-2.86	8.63	.1919	.15	6.53	10.02	4.97	.56	396.
13.000	-2.92	8.79	.1179	-.10	6.69	10.18	5.15	.67	394.
14.000	-3.70	8.70	.0591	-.70	6.36	10.02	5.45	.75	392.
15.000	-6.32	8.30	-.0425	-1.39	5.75	10.26	6.19	.81	388.
16.000	-9.52	6.64	-.0716	-.60	5.10	10.94	6.42	.50	375.
17.000	-10.93	5.18	-.0407	-.13	4.17	11.66	5.28	.26	330.
18.000	-10.90	5.01	.0732	.23	2.90	11.33	4.92	.33	329.
19.000	-9.43	4.76	.0176	.22	2.33	9.79	4.61	.31	325.
20.000	-8.52	5.36	-.0874	.23	2.39	9.11	4.91	.49	319.
21.000	-9.19	6.38	-.1101	.13	2.26	9.95	5.58	.44	311.
22.000	-10.37	6.92	-.0752	.07	2.23	11.15	6.00	.24	310.
23.000	-11.04	8.39	.0722	.03	2.28	12.31	6.76	.32	304.
24.000	-11.50	9.73	.0622	.04	2.47	13.36	7.37	.22	297.
25.000	-11.64	11.09	-.0810	.25	2.42	14.55	7.25	.02	291.
26.000	-11.19	12.24	-.0392	.24	2.90	15.11	7.41	-.08	280.
27.000	-10.11	12.98	.0020	.17	3.04	14.79	7.81	.07	254.
28.000	-8.09	13.44	.0361	.23	3.48	14.05	7.76	.20	239.
29.000	-5.55	14.13	.0585	.41	3.63	13.69	7.45	.23	208.
30.000	-3.39	15.89	.1224	.74	3.90	14.62	8.04	.20	155.

TABLE I. 12 WIND STATISTICAL PARAMETERS, DECEMBER
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-4.94	1.97	.1776	-1.00	1.65	5.32	1.91	-.10	377.
1.000	-10.37	4.34	.1974	-1.01	3.66	11.12	4.13	.17	427.
2.000	-8.86	4.69	.0929	-.45	3.58	9.74	4.32	.29	429.
3.000	-8.30	4.95	.1133	-.08	3.60	9.31	4.44	.21	429.
4.000	-8.13	4.79	.0709	.23	3.63	9.10	4.41	.36	429.
5.000	-8.23	4.81	.0073	.51	3.96	9.32	4.47	.40	429.
6.000	-8.40	5.11	-.0572	.89	4.42	9.76	4.65	.29	429.
7.000	-8.12	5.15	-.0775	.24	4.69	9.61	4.70	.29	429.
8.000	-7.25	5.48	-.1409	-.30	4.91	9.19	4.73	.57	424.
9.000	-5.79	5.90	-.1363	-.69	4.90	8.45	4.61	.58	424.
10.000	-4.18	6.06	-.0676	-.94	4.69	7.81	4.01	.52	422.
11.000	-2.91	6.45	-.0196	-.68	5.10	7.88	3.80	.55	421.
12.000	-2.08	6.46	-.0439	-.28	5.26	7.69	3.81	.71	419.
13.000	-1.84	6.39	-.1055	.09	5.36	7.57	3.93	.59	415.
14.000	-2.10	6.39	-.1530	.29	5.18	7.39	4.18	.90	413.
15.000	-3.71	5.86	-.1896	.82	5.34	7.52	4.55	1.05	410.
16.000	-6.63	5.54	-.2548	1.30	4.80	8.66	4.93	1.10	405.
17.000	-8.32	5.37	-.2366	1.62	4.19	9.73	4.84	.68	372.
18.000	-8.50	5.08	-.1889	1.04	3.08	9.27	4.77	.80	373.
19.000	-6.79	5.07	-.0316	.34	2.34	7.64	4.37	.77	37[illegible].
20.000	-5.43	6.20	.0065	.09	2.30	7.28	4.50	.73	368.
21.000	-5.37	7.86	.0772	.23	2.28	8.20	5.34	.64	331.
22.000	-6.50	8.31	.0062	.29	2.12	8.92	6.01	.61	330.
23.000	-7.24	8.75	-.0422	.24	2.38	9.68	6.39	.62	321.
24.000	-7.99	9.10	.0065	.12	2.51	10.55	6.45	.40	343.
25.000	-7.82	9.52	.0101	.07	2.39	11.20	5.64	.28	335.
26.000	-7.17	10.06	-.0074	.25	2.73	11.28	5.72	.22	324.
27.000	-5.00	11.38	.0417	.22	3.03	11.05	6.43	.28	279.
28.000	-2.93	12.45	.0162	.05	3.63	11.28	6.99	.72	260.
29.000	-1.37	13.78	.0850	.07	4.06	12.27	7.54	.84	230.
30.000	.83	15.82	.1283	.02	4.21	14.17	8.17	.80	178.

TABLE I. 13 WIND STATISTICAL PARAMETERS, ANNUAL
STATION = 912170 TAGUAC

Z KM	MEAN U M/S	S.D. U M/S	R(U,V)	MEAN V M/S	S.D. V M/S	MEAN WS M/S	S.D. WS M/S	SKEW WS	NOBS
.111	-3.66	2.65	.2808	-.30	1.92	4.51	1.97	.34	4514.
1.000	-7.34	5.70	.2779	.17	3.91	9.21	4.10	.41	4960.
2.000	-6.11	5.23	.2526	.27	3.61	7.91	3.90	.81	4976.
3.000	-5.67	5.09	.1967	.38	3.72	7.59	3.80	.75	4973.
4.000	-5.27	4.96	.1678	.35	3.86	7.27	3.82	.85	4974.
5.000	-5.16	5.10	.1228	.23	4.09	7.33	3.96	.90	4975.
6.000	-4.99	5.34	.0719	.20	4.37	7.45	4.13	.84	4961.
7.000	-4.36	5.43	.0238	-.12	4.42	7.22	3.99	.87	4944.
8.000	-3.42	5.77	-.0198	-.39	4.51	7.07	3.94	.89	4916.
9.000	-2.12	6.37	.0169	-.55	4.82	7.19	4.12	.92	4907.
10.000	-.99	7.06	.0842	-.47	5.18	7.68	4.36	.91	4887.
11.000	-.09	8.01	.1518	-.16	6.03	8.70	4.99	.91	4870.
12.000	.44	8.76	.1862	.04	7.01	9.76	5.55	.92	4849.
13.000	.39	9.28	.1670	-.08	7.78	10.54	5.98	.94	4819.
14.000	-.37	9.37	.1414	-.41	8.13	10.74	6.24	.93	4801.
15.000	-2.61	8.91	.1035	-.76	7.39	10.21	6.10	.95	4740.
16.000	-5.82	7.44	-.0123	-.58	5.77	9.53	5.65	.90	4569.
17.000	-7.72	6.17	-.0336	-.48	4.39	9.62	4.98	.58	4186.
18.000	-8.69	5.61	.0439	-.47	2.94	9.64	4.80	.35	4193.
19.000	-8.65	6.23	.0431	-.48	2.39	9.56	5.31	.42	4135.
20.000	-8.79	7.30	.0169	-.24	2.26	10.04	5.92	.49	4077.
21.000	-9.68	8.43	.0146	-.04	2.27	11.16	6.73	.43	3940.
22.000	-10.84	9.14	-.0316	.07	2.18	12.37	7.27	.43	3857.
23.000	-11.89	9.95	-.0465	.01	2.31	13.65	7.72	.40	3770.
24.000	-12.78	10.64	-.0413	-.05	2.50	14.73	8.13	.35	3746.
25.000	-13.71	11.48	-.0375	-.04	2.35	15.85	8.62	.30	3676.
26.000	-14.26	12.36	-.0239	-.02	2.70	16.73	9.13	.20	3539.
27.000	-14.66	13.49	-.0178	.04	3.01	17.71	9.61	.13	3269.
28.000	-14.48	14.57	.0002	.17	3.36	18.37	9.80	.19	3028.
29.000	-14.10	15.48	.0232	.29	3.58	18.80	9.90	.28	2684.
30.000	-13.66	16.60	.0497	.32	3.80	19.36	10.10	.32	1999.

TABLE 11,1 THERMODYNAMIC STATISTICAL PARAMETERS. JANUARY

STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1012.5000	2.2299	-.35	298.67	1.44	-.84	1169.0000	6.6800	.45	402.	402.	402.
.111	999.7500	2.2061	-.33	298.10	1.37	-.81	1157.0000	6.2810	.37	402.	402.	402.
1.000	902.8600	1.8907	-.26	292.43	1.03	.14	1068.0000	5.1060	-.19	409.	409.	409.
2.000	803.5300	1.6384	-.08	288.29	1.95	.09	967.0000	6.0600	.23	410.	410.	410.
3.000	713.8400	1.5494	.01	284.76	1.70	-.38	871.7000	4.6040	.33	410.	410.	410.
4.000	632.5700	1.5052	-.06	279.46	1.49	-.32	787.7000	3.9070	.17	410.	410.	410.
5.000	559.3300	1.4706	-.16	273.71	1.36	.30	711.4000	3.2880	-.40	410.	410.	410.
6.000	493.8200	1.4301	-.33	267.88	1.38	.08	641.9000	3.3050	-.17	410.	410.	410.
7.000	434.1300	1.3250	-.30	261.87	1.34	-.01	577.4000	2.6600	-.08	409.	409.	409.
8.000	380.7300	1.3047	-.23	255.44	1.20	.03	519.2000	2.1650	.15	406.	406.	406.
9.000	332.4900	1.2377	-.19	248.25	1.14	-.24	466.6000	1.8130	-.01	405.	405.	405.
10.000	289.6600	1.2108	-.29	240.64	1.18	-.01	419.3000	1.7180	.00	402.	402.	402.
11.000	251.0400	1.1534	-.26	232.72	1.18	.01	375.8000	1.3710	.16	399.	399.	399.
12.000	216.1600	1.1088	-.19	224.56	1.20	.15	335.3000	1.1490	-.12	398.	398.	398.
13.000	185.2500	1.1079	-.17	216.45	1.29	-.02	298.2000	1.2080	-.39	395.	395.	395.
14.000	157.9800	1.0338	-.14	208.51	1.45	-.19	263.9000	1.3500	-.57	395.	395.	395.
15.000	133.7000	1.0046	-.09	201.00	1.47	-.26	231.7000	1.4610	-.31	392.	392.	392.
16.000	112.6700	.9271	-.09	194.12	1.67	-.11	202.2000	1.6190	-.13	389.	389.	389.
17.000	94.5670	.8544	-.11	189.62	2.15	-.41	173.8000	2.1340	-.17	360.	360.	360.
18.000	79.1910	.7504	.00	191.10	2.90	.23	144.4000	2.6970	-.20	352.	352.	352.
19.000	66.5660	.6027	.09	198.02	2.95	.13	117.1000	2.0250	-.22	336.	336.	336.
20.000	56.2920	.5177	.05	204.35	2.72	-.16	95.9800	1.5920	.12	332.	332.	332.
21.000	47.7350	.4308	-.16	208.11	2.40	-.57	79.9200	1.0850	.44	256.	256.	256.
22.000	40.6530	.3832	-.23	211.40	2.47	-.33	67.0000	.8594	.36	250.	250.	250.
23.000	34.6790	.3506	-.31	214.24	2.56	-.21	56.4000	.6966	.22	247.	247.	247.
24.000	29.6040	.3073	-.19	216.74	2.35	-.29	47.5900	.5118	.20	307.	307.	307.
25.000	25.3710	.2894	-.20	218.74	2.26	.12	40.4100	.4381	-.20	303.	303.	303.
26.000	21.7510	.2673	-.18	220.70	2.15	.09	34.3400	.4278	-.18	300.	300.	300.
27.000	18.6590	.2497	-.07	222.51	2.10	.66	29.2100	.3868	-.03	223.	223.	223.
28.000	16.0470	.2181	.05	224.32	2.04	.12	24.9200	.3345	-.36	191.	191.	191.
29.000	13.8110	.1982	.22	226.09	2.49	.30	21.2800	.3149	-.55	171.	171.	171.
30.000	11.8330	.1734	.25	227.59	2.44	.33	18.2100	.2785	-.20	167.	167.	167.

TABLE II. 2 THERMODYNAMIC STATISTICAL PARAMETERS, FEBRUARY

STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1013.1000	2.1384	-.26	298.63	1.31	-.26	1170.0000	6.0840	.00	376.	376.	376.
.111	1000.4000	2.1149	-.27	298.03	1.25	-.23	1158.0000	5.7630	-.04	377.	377.	377.
1.000	903.3200	1.8531	-.30	292.09	1.02	-.26	1069.0000	4.8690	-.06	377.	377.	377.
2.000	803.8000	1.6659	-.23	287.64	1.70	-.07	969.3000	5.5080	.28	378.	378.	378.
3.000	713.9400	1.5370	-.13	284.42	1.82	-.09	872.8000	4.9360	.08	378.	378.	378.
4.000	632.6500	1.5120	-.11	279.56	1.70	-.09	787.6000	4.2860	.12	378.	378.	378.
5.000	559.4800	1.5049	-.09	273.98	1.67	-.27	710.9000	3.6480	.28	378.	378.	378.
6.000	493.9500	1.5361	-.31	268.17	1.42	-.38	641.4000	3.0920	.13	377.	377.	377.
7.000	434.2400	1.4371	-.20	261.79	1.20	-.42	577.8000	2.5510	.38	374.	374.	374.
8.000	380.8000	1.4125	-.22	255.11	1.08	-.23	520.0000	2.1870	.31	366.	366.	366.
9.000	332.5100	1.3546	-.13	247.97	1.15	.01	467.1000	1.6720	.03	366.	366.	366.
10.000	289.6100	1.2679	-.19	240.28	1.16	-.06	413.9000	1.4670	-.24	364.	364.	364.
11.000	250.9200	1.2172	-.17	232.31	1.19	-.15	376.3000	1.3540	-.14	362.	362.	362.
12.000	216.0000	1.1840	-.13	224.17	1.20	-.16	335.7000	1.2200	-.19	360.	360.	360.
13.000	185.0900	1.1554	-.11	216.09	1.28	-.15	298.4000	1.2750	-.24	355.	355.	355.
14.000	157.8100	1.0694	-.11	208.12	1.46	-.15	264.2000	1.3130	-.22	353.	353.	353.
15.000	133.5500	1.0209	-.08	200.61	1.38	-.15	231.9000	1.4390	-.17	349.	349.	349.
16.000	112.5500	.9173	-.04	193.97	1.56	.04	202.1000	1.6830	-.09	346.	346.	346.
17.000	94.4360	.8381	.05	190.84	1.98	-.28	172.4000	2.2700	.23	324.	324.	324.
18.000	79.1800	.7052	.09	192.56	2.55	.43	143.3000	2.3910	-.42	319.	319.	319.
19.000	66.5680	.5569	.12	198.03	2.90	.03	117.1000	2.0970	.11	317.	317.	317.
20.000	56.2620	.4630	.03	203.29	2.80	.08	96.4300	1.5900	.12	315.	315.	315.
21.000	47.6910	.4013	.04	207.61	2.57	-.25	83.0300	1.0930	.35	251.	251.	251.
22.000	40.5960	.3698	.01	211.02	2.78	-.41	67.0300	.6694	.22	250.	250.	250.
23.000	34.6210	.3370	-.04	213.80	2.29	-.27	56.4200	.6808	.39	245.	245.	245.
24.000	29.5460	.2948	-.03	216.45	2.01	-.14	47.5600	.4635	.16	293.	293.	293.
25.000	25.3150	.2744	-.05	218.64	2.00	-.07	40.3400	.3978	.03	288.	288.	288.
26.000	21.7050	.2493	-.07	220.73	2.09	-.23	34.2600	.4160	.08	286.	286.	286.
27.000	18.6370	.2199	-.12	222.77	2.36	.11	29.1500	.3743	-.31	215.	215.	215.
28.000	16.0360	.1997	-.05	225.05	2.49	.14	24.8200	.3447	-.22	188.	188.	188.
29.000	13.8070	.1857	.00	227.10	2.39	-.05	21.1800	.3061	.10	165.	165.	165.
30.000	11.8940	.1637	.08	229.05	2.59	.01	18.0900	.2643	.37	161.	161.	161.

TABLE 11. 3 THERMODYNAMIC STATISTICAL PARAMETERS, MARCH

STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1012.9000	1.8826	-.25	299.01	1.39	-.14	1168.0000	5.7680	.25	398.	398.	398.
.111	1000.1000	1.8726	-.25	298.39	1.32	-.13	1156.0000	5.3310	.21	398.	398.	398.
1.000	903.1300	1.8020	-.26	292.32	.93	-.19	1068.0000	4.4240	-.29	416.	416.	416.
2.000	803.6600	1.6487	-.23	287.88	1.59	.08	968.3000	4.9120	.13	416.	416.	416.
3.000	713.8700	1.5637	-.21	284.36	1.78	.20	872.7000	4.5090	-.19	416.	416.	416.
4.000	632.6000	1.5633	-.17	279.52	1.72	-.09	787.5000	4.0230	.15	416.	416.	416.
5.000	559.4500	1.5169	-.13	274.04	1.57	-.10	710.7000	3.7290	.24	416.	416.	416.
6.000	493.9200	1.5324	-.20	268.25	1.29	-.28	641.2000	3.0620	-.07	415.	415.	415.
7.000	434.2400	1.4107	-.14	262.04	1.09	-.18	577.2000	2.4300	.12	413.	413.	413.
8.000	380.8500	1.3528	-.13	255.47	1.11	-.06	519.3000	2.0740	.00	410.	410.	410.
9.000	332.6400	1.2542	-.04	248.34	1.14	-.03	466.6000	1.8670	.05	409.	409.	409.
10.000	289.8100	1.1946	.04	240.74	1.18	-.01	419.4000	1.6740	-.20	404.	404.	404.
11.000	251.1700	1.1407	.06	232.81	1.25	.00	375.8000	1.4480	-.20	402.	402.	402.
12.000	216.2700	1.1329	.11	224.61	1.29	-.19	335.4000	1.2360	-.15	402.	402.	402.
13.000	185.3600	1.1404	.15	216.48	1.36	-.21	298.3000	1.2800	-.40	399.	399.	399.
14.000	158.0700	1.0626	.13	208.45	1.45	.15	264.2000	1.3370	-.56	399.	399.	399.
15.000	133.7800	1.0210	.12	200.90	1.41	.14	232.0000	1.6130	-.29	395.	395.	395.
16.000	112.7700	.9218	.17	194.08	1.66	-.21	202.4000	1.8710	-.24	394.	394.	394.
17.000	94.6120	.8193	.24	190.06	2.18	-.24	173.4000	2.3860	-.06	371.	371.	371.
18.000	79.3010	.6663	.31	192.35	2.64	.04	143.7000	2.3790	.10	364.	364.	364.
19.000	66.6670	.5583	.28	198.32	2.39	.06	117.1000	1.7560	.16	352.	352.	352.
20.000	56.3570	.4784	.23	203.63	2.34	.32	96.4200	1.3270	.07	350.	350.	350.
21.000	47.7930	.4030	-.08	208.05	2.11	.20	80.0300	.9019	.22	281.	281.	281.
22 000	40.6950	.3794	.18	211.29	2.28	.11	67.1000	.7620	.18	279.	279.	279.
23.000	34.7170	.3496	.18	214.42	2.00	-.28	56.4100	.6546	.08	279.	279.	279.
24.000	29.6420	.2975	.18	217.15	2.02	.11	47.5600	.5560	.16	330.	330.	330.
25.000	25.4050	.2625	-.05	219.46	2.13	.14	40.3300	.4448	.07	329.	329.	329.
26.000	21.7970	.2383	-.09	221.93	2.09	.05	34.2200	.3818	-.05	328.	328.	328.
27.000	18.7280	.2163	-.16	224.15	2.20	-.22	29.1100	.3548	-.20	228.	228.	228.
28.000	16.1300	.1911	-.18	226.27	2.36	-.18	24.8300	.3341	-.17	197.	197.	197.
29.000	13.9060	.1749	.09	227.87	2.69	-.20	21.2600	.2846	.02	174.	174.	174.
30.000	11.9900	.1663	.14	229.83	2.78	.01	18.1600	.2282	.16	182.	182.	182.

TABLE 11. 4 THERMODYNAMIC STATISTICAL PARAMETERS, APRIL

STATION = 91217C TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1012.4000	1.5163	-.58	299.75	1.29	-.12	1164.0000	5.1690	.12	388.	388.	388.
.111	993.6300	1.5174	-.56	299.10	1.22	-.14	1152.0000	4.8260	.11	391.	391.	391.
1.000	903.0900	1.4118	-.56	292.88	.85	.09	1065.0000	3.9200	-.30	399.	399.	399.
2.000	803.7900	1.2439	-.39	288.23	1.30	.12	967.0000	4.1990	-.08	399.	399.	399.
3.000	714.0000	1.2131	-.21	284.00	1.36	-.41	873.8000	3.5780	.35	399.	399.	399.
4.000	632.6100	1.2554	-.10	279.14	1.41	.21	789.6000	3.6340	-.21	399.	399.	399.
5.000	559.3300	1.2021	-.02	273.73	1.30	.09	711.3000	3.1500	-.09	399.	399.	399.
6.000	493.7900	1.1504	-.02	268.04	1.18	-.26	641.5000	2.8160	-.06	399.	399.	399.
7.000	434.0800	1.0838	-.05	261.76	1.17	-.12	577.6000	2.5590	-.18	398.	398.	398.
8.000	380.6400	1.0583	-.15	255.10	1.25	-.30	519.8000	2.4100	.07	397.	397.	397.
9.000	332.3900	1.0430	-.23	247.98	1.29	-.23	466.9000	2.0690	.01	396.	396.	396.
10.000	289.5300	.9903	-.26	240.38	1.34	-.24	419.6000	1.7860	-.28	396.	396.	396.
11.000	250.8600	.9917	-.41	232.39	1.35	-.23	376.1000	1.4890	-.23	396.	396.	396.
12.000	215.9700	.9839	-.42	224.37	1.17	-.03	335.3000	1.0890	-.25	394.	394.	394.
13.000	185.0800	.9732	-.36	216.38	1.16	.07	298.0000	1.2550	-.70	393.	393.	393.
14.000	157.8400	.8918	-.32	208.51	1.23	.39	263.7000	1.3700	-1.12	393.	393.	393.
15.000	133.6400	.8688	-.36	201.31	1.33	.08	231.3000	1.8190	-.58	390.	390.	390.
16.000	112.7000	.7748	-.32	195.27	1.71	-.13	201.1000	2.0140	-.07	390.	390.	390.
17.000	94.6750	.6923	-.41	191.95	2.02	-.24	171.8000	1.9540	.11	369.	369.	369.
18.000	79.4120	.6312	-.26	192.86	2.24	.35	143.5000	1.7910	-.54	362.	362.	362.
19.000	66.7940	.5350	-.18	198.51	2.28	.34	117.2000	1.5650	-.29	351.	351.	351.
20.000	56.4930	.4817	-.08	204.73	2.35	-.09	96.1400	1.2420	-.05	348.	348.	348.
21.000	47.9410	.4054	.01	209.30	2.04	.21	79.7700	.7819	-.12	282.	282.	282.
22.000	40.8650	.3945	.26	212.72	2.17	.04	66.9300	.6502	-.10	279.	279.	279.
23.000	34.8970	.3588	.28	215.66	2.05	.72	56.3700	.6214	-.08	276.	276.	276.
24.000	29.8280	.3223	.26	218.51	2.01	.97	47.5600	.5646	.00	315.	315.	315.
25.000	25.6020	.2731	-.04	221.31	2.16	.82	40.3000	.4955	-.28	321.	321.	321.
26.000	21.9970	.2569	.27	223.95	2.34	.35	34.2200	.4185	.37	316.	316.	316.
27.000	18.9370	.2103	-.06	226.65	2.17	.23	29.1100	.3251	-.08	218.	218.	218.
28.000	16.3180	.1885	-.19	228.45	2.22	.01	24.8000	.2856	-.19	191.	191.	191.
29.000	14.0860	.1688	-.25	230.28	2.48	.17	21.3100	.2475	.01	167.	167.	167.
30.000	12.1750	.1529	-.20	232.33	2.55	-.26	18.2600	.2226	.10	154.	154.	154.

TABLE 11. 5 THERMODYNAMIC STATISTICAL PARAMETERS. MAY
STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1011.8000	1.5345	-.91	300.25	1.58	.03	1161.0000	6.4140	.10	396.	396.	396.
.111	999.1200	1.5205	-.91	299.62	1.50	.02	1149.0000	5.9740	.09	402.	402.	402.
1.000	902.8200	1.4543	-.84	293.63	.91	.00	1062.0000	4.0530	.02	406.	406.	406.
2.000	803.7800	1.2671	-.77	288.81	1.12	.09	964.6000	3.8930	-.13	406.	406.	406.
3.000	714.1800	1.2027	-.59	284.15	1.05	.26	872.8000	2.9800	-.40	406.	406.	406.
4.000	632.8300	1.2241	-.45	278.70	1.07	.30	789.5000	3.0050	-.32	405.	405.	405.
5.000	559.5300	1.1687	-.35	273.16	1.27	.15	712.7000	3.2520	-.20	405.	405.	405.
6.000	493.7300	1.0708	-.08	267.57	1.21	-.11	642.4000	2.6780	-.18	403.	403.	403.
7.000	433.9900	1.0351	-.01	261.41	1.14	-.35	578.2000	2.3230	-.31	403.	403.	403.
8.000	380.5000	1.0756	-.12	254.86	1.27	-.21	520.0000	2.1700	-.28	401.	401.	401.
9.000	332.2100	1.0950	-.12	247.73	1.37	-.22	467.1000	1.9290	-.16	400.	400.	400.
10.000	289.3200	1.0733	-.14	240.08	1.32	-.24	419.8000	1.6540	-.33	399.	399.	399.
11.000	250.6400	1.0480	-.19	232.16	1.31	-.07	376.1000	1.5130	-.60	399.	399.	399.
12.000	215.7400	1.0278	-.19	224.01	1.27	.06	335.5000	1.3180	-.45	397.	397.	397.
13.000	184.8500	1.0148	-.13	215.97	1.28	.25	298.2000	1.4210	-.57	394.	394.	394.
14.000	157.6100	.9276	-.07	208.22	1.41	.37	263.7000	1.6730	-.65	394.	394.	394.
15.000	133.4000	.8558	-.03	201.47	1.57	.13	230.8000	2.0680	-.32	392.	392.	392.
16.000	112.6200	.7871	-.02	196.02	1.85	-.04	200.2000	2.2160	-.03	391.	391.	391.
17.000	94.6050	.6411	-.13	193.53	1.92	-.03	170.5000	1.8780	-.05	359.	359.	359.
18.000	79.5930	.5886	-.09	195.18	2.44	.15	142.1000	1.8350	-.01	354.	354.	354.
19.000	67.0440	.5021	-.22	200.93	2.70	.15	116.3000	1.6180	-.07	340.	340.	340.
20.000	56.8290	.4513	-.16	206.98	2.30	.06	95.6600	1.2050	.02	335.	335.	335.
21.000	48.2940	.3913	-.20	210.75	1.89	-.07	79.8400	.8349	.08	251.	251.	251.
22.000	41.2040	.3509	-.14	213.75	1.84	.06	67.1600	.7202	-.27	251.	251.	251.
23.000	35.2190	.3063	-.07	216.74	2.03	-.04	56.6100	.6925	-.15	250.	250.	250.
24.000	30.1120	.2848	.14	219.52	2.01	.52	47.7900	.5781	-.09	274.	274.	274.
25.000	25.8690	.2324	-.10	221.84	1.98	.11	40.6300	.4722	.08	310.	310.	310.
26.000	22.2330	.2117	-.12	224.29	2.16	-.71	34.5400	.4177	.46	305.	305.	305.
27.000	19.1320	.1830	-.10	226.26	2.16	-.63	29.4600	.3255	.22	205.	205.	205.
28.000	16.4960	.1659	-.06	228.48	2.10	.24	25.1500	.2765	-.08	182.	182.	182.
29.000	14.2450	.1522	-.10	230.57	2.27	-.28	21.5700	.2532	.17	151.	151.	151.
30.000	12.3170	.1395	-.21	232.16	2.32	.01	18.4900	.2136	.21	130.	130.	130.

TABLE II. 6 THERMODYNAMIC STATISTICAL PARAMETERS, JUNE
STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1011.5000	1.1695	-.44	300.42	1.64	-.07	1160.0000	6.5680	.13	401.	401.	401.
.111	998.7700	1.1584	-.45	299.80	1.56	-.09	1148.0000	6.0540	.12	407.	407.	407.
1.000	902.6300	1.1334	-.48	294.05	.69	-.02	1060.0000	2.9210	.28	409.	409.	409.
2.000	803.7000	1.0114	-.55	288.83	.90	.01	963.8000	2.9390	-.01	410.	410.	410.
3.000	714.1400	.9806	-.44	283.99	.99	.07	872.8000	2.7620	-.55	409.	409.	409.
4.000	632.8100	1.0876	-.48	278.55	1.00	-.04	789.6000	2.3920	-.03	409.	409.	409.
5.000	559.4900	1.0475	-.49	272.79	1.02	-.12	713.3000	2.4060	-.05	409.	409.	409.
6.000	493.6100	1.0063	-.54	267.23	1.12	-.22	642.9000	2.3620	.02	409.	409.	409.
7.000	433.8600	1.0384	-.42	261.25	1.04	-.27	578.2000	1.8560	-.03	408.	408.	408.
8.000	380.3800	1.0760	-.53	254.74	1.11	-.28	520.0000	1.7470	-.11	407.	407.	407.
9.000	332.1100	1.1195	-.46	247.58	1.23	-.24	467.2000	1.5570	-.42	406.	406.	406.
10.000	289.1700	1.0740	-.38	239.89	1.23	-.16	413.9000	1.3010	-.84	406.	406.	406
11.000	250.4500	1.0689	-.42	231.82	1.26	-.25	376.4000	1.2620	-.38	406.	406.	406.
12.000	215.5200	1.0653	-.31	223.53	1.26	-.03	335.9000	1.1100	-.36	404.	404.	404.
13.000	184.5700	1.0713	-.23	215.32	1.35	.10	298.6000	1.2650	-.53	404.	404.	404.
14.000	157.2900	1.0058	-.25	207.35	1.55	-.03	264.3000	1.4680	-.38	404.	404.	404.
15.000	133.1400	.9639	-.23	200.53	1.77	.06	231.3000	1.8640	-.40	398.	398.	398.
16.000	112.3400	.8895	-.17	195.76	2.24	-.36	199.9000	2.3720	.00	395.	395.	395.
17.000	94.4640	.7710	-.09	196.00	2.34	.21	167.9000	2.3650	-.23	363.	363.	363.
18.000	79.6450	.6591	-.08	199.58	2.34	.25	139.0000	1.9910	.02	360.	360.	360.
19.000	67.3080	.5476	-.25	204.33	2.06	.16	114.8000	1.4480	-.19	349.	349.	349.
20.000	57.1580	.4764	-.27	208.42	1.99	.07	95.5500	1.0690	-.14	345.	345.	345.
21.000	48.6410	.4069	-.01	211.58	1.82	.10	80.0900	.8343	.09	253.	253.	253.
22.000	41.5310	.3661	.11	214.43	1.95	-.05	67.4800	.7661	-.16	250.	250.	250.
23.000	35.5040	.3168	.19	216.89	1.81	.06	57.0300	.6724	.03	247.	247.	247.
24.000	30.3680	.3059	-.06	219.32	1.68	-.02	48.2400	.5848	-.21	260.	260.	260.
25.000	26.0530	.2453	-.10	221.72	1.81	-.05	40.9500	.4707	-.21	321.	321.	321.
26.000	22.3940	.2167	-.06	223.78	1.91	-.85	34.8600	.4103	-.03	320.	320.	320.
27.000	19.2650	.1884	-.11	225.70	1.83	-.26	29.7400	.3353	.00	216.	216.	216.
28.000	16.6110	.1730	-.09	227.82	2.05	.06	25.4000	.3043	-.02	181.	181.	181.
29.000	14.3340	.1563	-.17	229.31	2.41	-.48	21.7800	.2695	.03	150.	150.	150.
30.000	12.3900	.1464	-.17	230.61	2.49	.04	18.7200	.2239	-.20	124.	124.	124.

TABLE 11. 7 THERMODYNAMIC STATISTICAL PARAMETERS, JULY
STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1010.6000	1.8332	-.07	300.11	1.80	.03	1160.0000	7.6930	.09	420.	420.	420.
.111	997.8800	1.8140	-.05	299.48	1.71	.02	1148.0000	7.1410	.10	420.	420.	420.
1.000	901.8400	1.7148	-.06	294.15	.71	-.33	1059.0000	3.2870	.12	421.	421.	421.
2.000	803.0300	1.5224	.05	288.86	.88	.06	962.5000	3.2760	.05	423.	423.	423.
3.000	713.6300	1.3680	.09	283.88	.92	-.35	872.0000	2.8350	.39	423.	423.	423.
4.000	632.3400	1.3873	-.05	278.22	.85	-.08	789.4000	2.5460	.15	423.	423.	423.
5.000	559.0800	1.2767	-.02	272.52	.88	.25	713.1000	2.5220	-.12	423.	423.	423.
6.000	493.1900	1.0943	.28	267.02	.95	.02	642.5000	2.4710	.05	420.	420.	420.
7.000	433.5100	1.0649	.25	261.09	1.07	-.04	577.9000	2.3740	.00	418.	418.	418.
8.000	380.0200	1.0105	.29	254.67	1.16	-.27	519.6000	2.1720	.15	416.	416.	416.
9.000	331.8000	1.0012	.18	247.62	1.20	-.37	466.7000	1.8430	.33	416.	416.	416.
10.000	288.9000	.9958	.14	239.97	1.24	-.06	419.4000	1.5830	.19	415.	415.	415.
11.000	250.2300	.9661	.14	231.83	1.30	-.09	376.0000	1.3870	.03	414.	414.	414.
12.000	215.3300	.9876	.07	223.41	1.30	-.08	335.8000	1.1520	-.38	413.	413.	413.
13.000	184.3600	1.0064	.01	215.07	1.38	.02	298.6000	1.2650	-.68	412.	412.	412.
14.000	157.0800	.9474	.04	206.95	1.61	.37	264.4000	1.5230	-.61	409.	409.	409.
15.000	132.9000	.8967	.13	199.79	1.82	.32	231.7000	1.9910	-.41	400.	400.	400.
16.000	112.0800	.8215	.26	195.11	2.56	.20	200.1000	2.8630	-.35	395.	395.	395.
17.000	94.3530	.6951	.24	197.85	2.60	-.56	166.2000	2.6440	.61	360.	360.	360.
18.000	79.6810	.6070	.35	201.69	1.86	-.15	137.6000	1.6660	.41	356.	356.	356.
19.000	67.4260	.4775	.21	205.57	1.81	-.15	114.3000	1.1910	.41	346.	346.	346.
20.000	57.2930	.4451	.28	208.93	1.88	.03	95.5400	.9604	.02	344.	344.	344.
21.000	48.7320	.3738	-.02	211.78	1.66	.06	80.1700	.7750	.02	227.	227.	227.
22.000	41.5950	.3312	.03	214.15	1.92	-.01	67.6700	.7480	-.28	221.	221.	221.
23.000	35.5560	.3004	.10	216.45	1.92	.11	57.2300	.6543	-.31	217.	217.	217.
24.000	30.4190	.2741	.08	218.83	1.89	.43	48.4300	.5389	.16	222.	222.	222.
25.000	26.1070	.2337	.14	220.89	1.82	.09	41.1800	.4551	-.01	298.	298.	298.
26.000	22.4200	.2117	.19	222.90	1.99	.10	35.0400	.3998	-.27	294.	294.	294.
27.000	19.2640	.1918	.16	224.72	1.97	.00	29.8600	.3135	.09	222.	222.	222.
28.000	16.5330	.1756	.01	226.79	2.17	.08	25.5000	.2821	.13	189.	189.	189.
29.000	14.3100	.1659	-.02	228.24	2.47	-.18	21.8400	.2415	.09	155.	155.	155.
30.000	12.3520	.1551	-.18	229.51	2.68	.00	18.7500	.2057	.46	123.	123.	123.

TABLE II. 8 THERMODYNAMIC STATISTICAL PARAMETERS, AUGUST

STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1010.3000	2.2548	-1.43	299.85	1.71	.26	1160.0000	7.3760	-.08	417.	417.	417.
.111	997.5800	2.2302	-1.44	299.24	1.63	.26	1148.0000	6.9230	-.05	418.	418.	418.
1.000	901.5300	2.1253	-1.41	294.15	.85	-.49	1058.0000	3.7080	.21	419.	419.	419.
2.000	802.7800	1.8933	-1.46	288.88	.91	-.10	961.9000	3.5300	-.42	421.	421.	421.
3.000	713.4200	1.6914	-1.41	283.79	.96	-.05	871.7000	3.3270	-.61	421.	421.	421.
4.000	632.1400	1.6008	-1.21	278.21	.92	.13	788.8000	3.1030	-.62	421.	421.	421.
5.000	558.9500	1.4063	-1.06	272.58	.91	-.02	712.5000	3.0860	-.60	421.	421.	421.
6.000	493.1000	1.1903	-.85	267.10	.99	-.03	642.0000	3.0610	-.76	421.	421.	421.
7.000	433.5000	1.0645	-.59	261.27	1.10	-.02	577.4000	2.9040	-.70	418.	418.	418.
8.000	380.0800	.9511	-.13	254.94	1.28	.10	519.1000	2.7030	-.72	417.	417.	417.
9.000	331.9100	.9135	.02	247.90	1.40	.07	466.3000	2.4210	-.67	416.	416.	416.
10.000	289.0100	.9320	.11	240.26	1.51	-.06	419.0000	2.1090	-.59	415.	415.	415.
11.000	250.3600	.9471	.08	232.14	1.57	-.08	375.7000	1.7420	-.47	415.	415.	415.
12.000	215.4900	.9940	-.11	223.67	1.59	-.25	335.6000	1.4220	-.33	414.	414.	414.
13.000	184.5500	1.0396	-.05	215.22	1.61	-.29	298.7000	1.3140	-.26	413.	413.	413.
14.000	157.2300	1.0109	-.15	206.94	1.61	-.03	264.7000	1.3630	-.45	413.	413.	413.
15.000	133.0400	.9240	-.15	199.69	1.71	.19	232.1000	2.1180	-.73	408.	408.	408.
16.000	112.1600	.8039	-.04	195.22	2.81	.38	200.2000	3.3210	-.40	405.	405.	405.
17.000	94.4170	.6789	.09	197.94	2.72	-.78	165.2000	2.6040	.61	368.	368.	368.
18.000	79.7400	.5989	.21	201.82	2.07	-.16	137.7000	1.5630	.23	358.	358.	358.
19.000	67.5020	.4880	-.20	205.67	1.94	.10	114.3000	1.2100	-.06	351.	351.	351.
20.000	57.3510	.4390	-.21	208.72	1.88	.04	95.7300	.9810	-.15	348.	348.	348.
21.000	48.8150	.3810	-.24	211.62	1.75	.25	80.3600	.7957	-.20	254.	254.	254.
22.000	41.6660	.3467	.09	213.97	1.83	-.05	67.8400	.6919	-.16	245.	245.	245.
23.000	35.5950	.3089	.08	215.89	1.89	.02	57.4400	.6167	.04	240.	240.	240.
24.000	30.4250	.2916	-.03	217.74	1.95	.53	48.6800	.5509	-.27	251.	251.	251.
25.000	26.0830	.2360	-.01	219.70	2.01	.65	41.3600	.4487	-.14	294.	294.	294.
26.000	22.3830	.2230	.13	221.88	2.20	.17	35.1500	.3788	.07	290.	290.	290.
27.000	19.2050	.1990	-.03	223.90	2.31	.08	29.9000	.3148	.37	187.	187.	187.
28.000	16.5280	.1766	-.05	225.70	2.39	.18	25.5100	.2936	.20	148.	148.	148.
29.000	14.2430	.1616	-.14	227.26	2.44	.03	21.0300	.2592	-.13	114.	114.	114.
30.000	12.2960	.1554	-.43	228.53	2.52	-.29	18.7400	.1935	-.02	101.	101.	101.

TABLE 11. 9 THERMODYNAMIC STATISTICAL PARAMETERS, SEPTEMBER
STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1010.5000	2.3086	-1.49	300.02	1.74	-.06	1160.0000	7.6990	.23	398.	398.	398.
.111	997.7500	2.2827	-1.48	299.41	1.65	-.07	1148.0000	7.1920	.22	399.	399.	399.
1.000	901.7600	2.1712	-1.29	294.32	.79	-.33	1058.0000	3.6850	-.55	401.	401.	401.
2.000	803.0200	1.8693	-1.24	[illegible].08	.90	.29	961.5000	4.0400	-1.07	403.	403.	403.
3.000	713.7000	1.6497	-1.19	[illegible]84.03	.99	-.01	871.4000	3.6050	-.83	403.	403.	403.
4.000	632.4800	1.5702	-.86	278.38	.95	-.26	788.9000	3.1680	-.78	403.	403.	403.
5.000	559.2600	1.3952	-.63	272.59	.98	-.03	713.0000	3.1650	-.83	403.	403.	403.
6.000	493.3300	1.1692	-.48	267.03	1.03	.00	642.6000	2.9840	-.76	403.	403.	403.
7.000	433.6600	1.1038	-.19	261.15	1.11	.21	578.0000	2.7380	-.67	403.	403.	403.
8.000	380.1900	1.0149	-.14	254.73	1.22	.25	519.7000	2.5850	-.58	403.	403.	403.
9.000	331.9700	.9987	-.02	247.68	1.37	.00	466.8000	2.3610	-.34	402.	402.	402.
10.000	289.0200	.9486	.00	240.12	1.44	-.01	419.3000	2.0190	-.38	400.	400.	400.
11.000	250.3500	.9593	-.03	232.00	1.47	-.04	375.9000	1.6840	-.36	400.	400.	400.
12.000	215.4600	.9900	-.09	223.56	1.42	-.06	335.8000	1.3020	-.37	399.	399.	399.
13.000	184.5300	1.0121	-.13	215.18	1.43	-.08	298.8000	1.3000	-.48	397.	397.	397.
14.000	157.2200	.9608	-.13	207.06	1.57	.08	264.5000	1.5070	-1.18	393.	393.	393.
15.000	133.0200	.9003	-.08	200.00	1.70	.46	231.7000	2.0040	-.72	391.	391.	391.
16.000	112.1900	.8136	.03	195.36	2.49	-.16	200.1000	2.6870	.04	388.	388.	388.
17.000	94.3890	.6985	.03	196.47	2.80	-.52	167.4000	2.5560	.56	344.	344.	344.
18.000	79.6220	.6231	.09	200.30	2.10	-.01	138.5000	1.6990	.16	334.	334.	334.
19.000	67.3060	.5443	-.05	204.38	2.00	-.38	114.7000	1.2460	.02	323.	323.	323.
20.000	57.1410	.4878	-.07	207.76	1.79	.14	95.8200	.9411	-.01	321.	321.	321.
21.000	48.6020	.4337	.19	210.90	1.78	.15	80.2900	.7858	-.10	226.	226.	226.
22.000	41.4440	.3800	.12	213.12	2.01	.04	67.7500	.7831	-.16	220.	220.	220.
23.000	35.4030	.3481	.17	215.16	1.85	.09	57.3300	.6789	-.40	216.	216.	216.
24.000	30.2240	.3248	.27	217.22	1.94	-.03	48.4800	.5858	.03	239.	239.	239.
25.000	25.9350	.2801	.24	219.63	1.82	-.06	41.1400	.4448	.07	286.	286.	286.
26.000	22.2530	.2521	.20	221.74	2.00	-.17	34.9600	.3994	.36	285.	285.	285.
27.000	19.1270	.2256	.48	223.95	2.04	.06	29.7500	.3398	.51	183.	183.	183.
28.000	16.4570	.2013	.09	226.07	2.14	.15	25.3600	.3048	.24	149.	149.	149.
29.000	14.2010	.1715	.30	228.38	2.44	-.16	21.6600	.2837	.44	127.	127.	127.
30.000	12.2460	.1535	.16	229.69	2.49	-.07	18.5600	.2392	-.12	125.	125.	125.

TABLE 11. 10 THERMODYNAMIC STATISTICAL PARAMETERS, OCTOBER

STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1010.4000	2.1000	-1.13	300.07	1.65	-.06	1159.0000	7.1810	.22	406.	406.	406.
.111	997.7400	2.0752	-1.11	299.45	1.58	-.08	1148.0000	6.7360	.21	407.	407.	407.
1.000	901.7500	1.9048	-1.11	294.27	.82	-.30	1058.0000	3.8660	-.23	410.	410.	410.
2.000	803.0400	1.6680	-1.04	289.05	.92	-.02	961.8000	3.7790	-.52	411.	411.	411.
3.000	713.6900	1.4796	-.96	284.10	.94	-.46	871.3000	3.4110	-.48	411.	411.	411.
4.000	632.4900	1.3471	-.68	278.67	1.02	.35	788.4000	3.3410	-.65	411.	411.	411.
5.000	559.2900	1.2198	-.44	273.02	1.07	.26	712.2000	3.2020	-.69	411.	411.	411.
6.000	493.4900	1.0568	-.35	267.49	1.11	.14	641.8000	3.1230	-.89	410.	410.	410.
7.000	433.8500	.9799	-.10	261.44	1.29	-.25	577.6000	3.1190	-.76	409.	409.	409.
8.000	380.4000	.9683	.10	254.93	1.50	-.12	519.5000	2.9490	-.92	407.	407.	407.
9.000	332.1700	1.0275	.01	247.84	1.67	-.09	466.8000	2.6980	-1.10	405.	405.	405.
10.000	289.2500	1.0578	.00	240.16	1.74	.10	419.5000	2.3520	-1.62	404.	404.	404.
11.000	250.5600	1.1072	-.07	232.17	1.76	.07	375.9000	2.0060	-2.19	402.	402.	402.
12.000	215.6700	1.1511	-.07	223.87	1.61	.05	335.6000	1.3550	-.31	401.	401.	401.
13.000	184.7400	1.1526	.01	215.63	1.53	.04	298.5000	1.4150	-.80	400.	400.	400.
14.000	157.4600	1.0701	.05	207.62	1.60	.23	264.2000	1.7660	-.87	400.	400.	400.
15.000	133.2600	.9840	.06	200.76	1.78	.24	231.2000	2.2780	-.46	398.	398.	398.
16.000	112.3800	.8462	.03	195.22	2.26	.07	200.6000	2.7900	.11	394.	394.	394.
17.000	94.4590	.7021	-.04	193.51	2.58	.01	170.1000	2.7690	.08	341.	341.	341.
18.000	79.4620	.5989	.13	196.81	3.05	-.25	140.7000	2.4450	.38	328.	328.	328.
19.000	67.0480	.4882	-.10	202.42	2.51	-.22	115.4000	1.5420	.29	305.	305.	305.
20.000	56.8610	.4697	.35	206.53	2.23	-.33	95.9200	1.1710	.26	302.	302.	302.
21.000	48.3020	.3813	-.30	210.19	1.81	-.15	80.0600	.8552	.20	230.	230.	230.
22.000	41.1970	.3486	.07	213.15	2.17	-.01	67.3400	.8259	.10	226.	226.	226.
23.000	35.1880	.3286	.28	215.18	2.12	-.13	56.9700	.6599	.27	224.	224.	224.
24.000	30.0430	.3135	.14	217.53	2.18	.10	48.1200	.5769	.07	248.	248.	248.
25.000	25.7720	.2548	-.40	220.07	2.06	.25	40.8000	.4829	-.10	265.	265.	265.
26.000	22.1240	.2348	-.23	222.80	2.14	.07	34.5900	.4181	-.06	264.	264.	264.
27.000	19.0100	.1988	-.17	225.12	2.16	-.01	29.4200	.3460	-.19	191.	191.	191.
28.000	16.3780	.1860	.01	227.13	2.60	-.42	25.1200	.3113	-.07	170.	170.	170.
29.000	14.1270	.1671	.03	229.21	2.84	-1.07	21.4700	.2618	.33	137.	137.	137.
30.000	12.2150	.1532	-.03	231.29	2.55	-.07	18.4000	.2346	-.22	117.	117.	117.

TABLE II. 11 THERMODYNAMIC STATISTICAL PARAMETERS, NOVEMBER
STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1010.4000	2.4211	-1.49	300.09	1.36	-.30	1160.0000	6.0500	.40	397.	397.	397.
.111	997.7000	2.3950	-1.49	299.49	1.30	-.31	1148.0000	5.6970	.36	398.	398.	398.
1.000	901.5900	2.2148	-1.48	294.04	.73	-.09	1059.0000	3.8490	-.29	401.	401.	401.
2.000	802.9400	1.9604	-1.44	289.23	1.03	.13	961.7000	4.0880	-.44	401.	401.	401.
3.000	713.5600	1.7211	-1.35	284.44	1.07	-.22	870.8000	3.5250	-.35	401.	401.	401.
4.000	632.4900	1.5847	-1.14	279.15	1.10	.38	787.5000	3.1800	-.61	401.	401.	401.
5.000	559.3100	1.4067	-.94	273.55	1.14	.25	711.2000	3.2060	-.42	401.	401.	401.
6.000	493.6100	1.2817	-.84	267.80	1.15	.02	641.5000	3.1180	-.50	401.	401.	401.
7.000	433.9800	1.1645	-.63	261.75	1.29	-.25	577.3000	3.0870	-.36	400.	400.	400.
8.000	380.5900	1.0799	-.38	255.22	1.44	-.51	519.4000	2.9960	-.19	397.	397.	397.
9.000	332.3700	1.0445	-.20	248.15	1.61	-.21	466.5000	2.7680	-.29	395.	395.	395.
10.000	289.4900	1.0155	-.13	240.59	1.60	-.16	419.2000	2.3350	-.37	392.	392.	392.
11.000	250.8500	1.0252	-.15	232.68	1.58	-.30	375.6000	1.8510	-.18	392.	392.	392.
12.000	216.0200	1.0442	-.23	224.53	1.42	-.29	335.2000	1.3410	-.54	390.	390.	390.
13.000	185.1500	1.0397	-.21	216.45	1.38	-.07	298.0000	1.3620	-.88	387.	387.	387.
14.000	157.8800	.9726	-.23	208.51	1.50	.18	263.8000	1.5820	-.63	387.	387.	387.
15.000	133.6700	.9157	-.23	201.22	1.64	.12	231.4000	1.9050	-.48	381.	381.	381.
16.000	112.7000	.8090	-.31	194.79	2.03	-.30	201.6000	2.2340	.00	380.	380.	380.
17.000	94.6500	.7306	-.26	191.36	2.07	-.03	172.3000	2.3070	-.07	350.	350.	350.
18.000	79.4300	.6415	-.05	193.13	2.95	.26	143.3000	2.4790	-.31	343.	343.	343.
19.000	66.8210	.5108	.06	199.46	2.94	-.01	116.7000	1.8810	.10	319.	319.	319.
20.000	56.5830	.4699	.07	205.38	2.35	-.27	95.9900	1.2610	.16	317.	317.	317.
21.000	48.0010	.3886	.20	209.31	2.11	.01	79.9000	.9160	.05	249.	249.	249.
22.000	40.9170	.3540	.15	212.31	2.30	-.11	67.1500	.7923	.12	248.	248.	248.
23.000	34.9400	.3262	.00	215.21	2.23	.04	56.5600	.7028	.13	248.	248.	248.
24.000	29.8590	.2794	.30	217.87	2.07	.34	47.7100	.5754	.14	283.	283.	283.
25.000	25.6110	.2535	.15	220.49	2.31	.35	40.4700	.4661	.13	287.	287.	287.
26.000	21.9950	.2328	.24	223.08	2.31	.32	34.3500	.3985	-.09	287.	287.	287.
27.000	18.8990	.1936	.24	225.16	2.58	.18	29.2400	.3537	-.08	210.	210.	210.
28.000	16.2880	.1846	.14	227.35	2.70	-.09	24.9600	.3233	-.02	176.	176.	176.
29.000	14.0550	.1755	-.03	229.45	2.83	-.58	21.3400	.2694	.18	155.	155.	155.
30.000	12.1300	.1620	.07	230.83	2.56	-.58	18.3100	.2231	-.03	145.	145.	145.

TABLE II. 12 THERMODYNAMIC STATISTICAL PARAMETERS, DECEMBER
STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1012.0000	1.6543	-.73	299.57	1.25	-.50	1164.0000	5.5460	.27	420.	420.	420.
.111	999.2700	1.6369	-.72	298.99	1.19	-.48	1152.0000	5.2260	.20	424.	424.	424.
1.000	902.7600	1.4619	-.68	293.33	.98	.28	1064.0000	4.4030	-.17	425.	425.	425.
2.000	803.7400	1.2598	-.59	288.86	1.31	-.42	964.8000	4.4310	.49	427.	427.	427.
3.000	714.1700	1.1681	-.37	284.67	1.42	-.09	871.8000	3.7730	.00	427.	427.	427.
4.000	632.9500	1.1780	-.18	279.51	1.46	-.08	787.7000	3.6720	.13	427.	427.	427.
5.000	559.7400	1.1597	-.04	273.77	1.31	-.01	711.6000	3.0370	-.17	427.	427.	427.
6.000	494.0900	1.1614	.07	267.92	1.28	-.06	642.1000	2.7100	-.06	427.	427.	427.
7.000	434.3300	1.1034	.01	261.69	1.24	-.38	578.1000	2.4760	.12	426.	426.	426.
8.000	380.8900	1.0774	-.12	255.17	1.17	-.08	520.0000	2.2600	-.25	422.	422.	422.
9.000	332.5700	1.0408	-.08	247.98	1.18	-.27	467.2000	1.9860	.28	421.	421.	421.
10.000	289.6900	1.0403	-.18	240.32	1.19	-.31	419.9000	1.7020	.37	421.	421.	421.
11.000	250.9900	1.0017	-.18	232.40	1.21	-.35	376.2000	1.4410	.21	420.	420.	420.
12.000	216.0700	.9762	-.13	224.22	1.18	-.55	335.7000	1.2190	.26	418.	418.	418.
13.000	185.1300	.9634	-.13	216.12	1.29	-.55	298.4000	1.3080	-.26	417.	417.	417.
14.000	157.8500	.9094	-.14	208.20	1.52	-.29	264.1000	1.4610	-.45	417.	417.	417.
15.000	133.5500	.8946	-.16	200.81	1.48	-.10	231.7000	1.6230	-.23	413.	413.	413.
16.000	112.5500	.8352	-.15	194.14	1.61	-.08	202.0000	1.6510	-.24	410.	410.	410.
17.000	94.4380	.7809	.03	189.72	1.94	.01	173.4000	1.7920	-.14	390.	390.	390.
18.000	79.1430	.7264	.27	191.37	2.57	.27	144.1000	2.3060	-.47	385.	385.	385.
19.000	66.4880	.5858	.20	198.41	2.67	-.02	116.8000	1.8650	.07	370.	370.	370.
20.000	56.2660	.5288	.16	204.75	2.63	-.12	95.7500	1.4220	.14	367.	367.	367.
21.000	47.7170	.4286	.11	209.00	2.44	.01	79.5400	1.0200	-.09	301.	301.	301.
22.000	40.6830	.4021	.09	212.39	2.39	-.09	66.7300	.8270	-.06	298.	298.	298.
23.000	34.7480	.3826	.30	215.59	2.32	.17	56.1500	.6800	-.02	297.	297.	297.
24.000	29.6750	.3392	.31	218.06	2.38	.55	47.4100	.5289	.27	337.	337.	337.
25.000	25.4560	.3043	-.02	220.26	2.54	.46	40.2600	.4705	-.13	341.	341.	341.
26.000	21.8510	.2798	-.03	222.30	2.53	.15	34.2400	.4416	-.09	339.	339.	339.
27.000	18.7620	.2398	.16	224.47	2.50	.42	29.1200	.4111	-.13	262.	262.	262.
28.000	16.1560	.2110	.07	226.39	2.42	.01	24.8600	.3408	-.09	222.	222.	222.
29.000	13.9250	.2002	.26	228.36	2.97	.27	21.2400	.2939	.03	191.	191.	191.
30.000	12.0150	.1815	.21	229.78	3.08	.10	18.2200	.2433	.01	186.	186.	186.

TABLE 11. 13 THERMODYNAMIC STATISTICAL PARAMETERS, ANNUAL

STATION = 912170 TAGUAC

Z KM	MEAN P MB	S.D. P MB	SKEW P	MEAN T DEG K	S.D. T DEG K	SKEW T	MEAN D G/M3	S.D. D G/M3	SKEW D	NOBS P	NOBS T	NOBS D
.000	1011.5000	2.2076	-.78	299.71	1.63	.00	1163.0000	7.6520	.07	4819.	4819.	4819.
.111	999.8000	2.1749	-.79	299.10	1.56	.00	1151.0000	7.2230	.06	4843.	4843.	4843.
1.000	902.4200	1.9009	-.96	293.48	1.17	-.44	1063.0000	5.7530	.34	4893.	4893.	4893.
2.000	803.4000	1.6249	-.96	288.65	1.34	-.47	964.5000	5.0440	.41	4905.	4905.	4905.
3.000	713.8400	1.4642	-.80	284.21	1.32	.13	872.1000	3.7950	-.08	4904.	4904.	4904.
4.000	632.5800	1.4272	-.58	278.92	1.35	.41	788.4000	3.4830	-.30	4903.	4903.	4903.
5.000	559.3600	1.3372	-.40	273.28	1.35	.38	712.0000	3.2790	-.34	4903.	4903.	4903.
6.000	493.6300	1.2696	-.21	267.62	1.26	.09	642.0000	2.9540	-.37	4895.	4895.	4895.
7.000	433.9400	1.1895	-.10	261.54	1.21	-.11	577.7000	2.6340	-.35	4879.	4879.	4879.
8.000	380.5000	1.1576	-.03	255.03	1.26	-.15	519.6000	2.4170	-.37	4849.	4849.	4849.
9.000	332.2600	1.1299	-.01	247.92	1.34	-.16	466.8000	2.1360	-.42	4837.	4837.	4837.
10.000	289.3700	1.1088	-.02	240.28	1.38	-.09	419.5000	1.8660	-.60	4818.	4818.	4818.
11.000	250.7000	1.0953	-.05	232.28	1.42	-.13	376.0000	1.5780	-.64	4807.	4807.	4807.
12.000	215.0000	1.0968	-.08	224.04	1.40	-.17	335.6000	1.2640	-.28	4790.	4790.	4790.
13.000	184.8800	1.1042	-.06	215.85	1.46	-.18	298.4000	1.3320	-.51	4766.	4766.	4766.
14.000	157.6000	1.0421	-.08	207.86	1.62	-.06	264.1000	1.5150	-.65	4757.	4757.	4757.
15.000	133.3900	.9638	-.05	200.67	1.69	-.01	231.6000	1.9050	-.51	4707.	4707.	4707.
16.000	112.4800	.8766	-.02	194.93	2.19	.18	201.0000	2.5370	-.46	4677.	4677.	4677.
17.000	94.5130	.7523	-.02	193.23	3.79	.30	170.5000	3.6090	-.28	4299.	4299.	4299.
18.000	79.4500	.6844	-.04	195.70	4.69	.14	141.5000	3.3090	.01	4215.	4215.	4215.
19.000	66.9610	.6386	-.09	201.17	3.88	-.06	116.0000	2.0080	.29	4059.	4059.	4059.
20.000	56.7400	.6246	-.01	206.13	3.01	-.27	95.3100	1.2820	.22	4024.	4024.	4024.
21.000	48.1670	.5746	.06	209.80	2.51	-.33	79.9900	.9258	.04	3061.	3061.	3061.
22.000	41.0050	.5314	.05	212.77	2.46	-.34	67.2400	.8454	-.01	3017.	3017.	3017.
23.000	35.0680	.4845	.02	215.43	2.30	-.13	56.7100	.7859	.05	2986.	2986.	2986.
24.000	29.9430	.4361	.12	217.88	2.26	.14	47.8800	.6876	.23	3359.	3359.	3359.
25.000	25.7110	.3859	-.10	220.25	2.33	.16	40.6700	.5922	.10	3643.	3643.	3643.
26.000	22.0710	.3485	-.13	222.52	2.45	.00	34.5600	.5293	.11	3614.	3614.	3614.
27.000	18.9580	.3090	-.15	224.60	2.53	.02	29.4100	.4606	-.01	2560.	2560.	2560.
28.000	16.3260	.2769	-.16	226.66	2.63	-.03	25.0900	.4035	-.03	2184.	2184.	2184.
29.000	14.0720	.2528	-.17	228.50	2.88	-.14	21.4600	.3603	.05	1857.	1857.	1857.
30.000	12.1350	.2327	-.13	230.08	2.94	-.05	18.3700	.3221	.07	1715.	1715.	1715.

TABLE III.1 MOISTURE RELATED STATISTICAL PARAMETERS, JANUARY

STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	27.104	2.472	-.47	301.73	1.58	-.85	295.50	1.54	-.73	402.	402.
.111	26.203	2.361	-.48	301.08	1.50	-.81	294.95	1.52	-.75	402.	402.
1.000	17.859	2.733	-.63	294.64	1.15	.07	288.70	2.58	-1.14	408.	409.
2.000	8.764	4.638	-.03	289.49	1.74	-.25	275.90	9.20	-.52	410.	410.
3.000	3.513	3.054	1.33	285.29	1.52	-.40	262.33	9.49	.86	408.	410.
4.000	1.773	1.716	2.09	279.76	1.42	-.32	254.23	8.13	1.47	409.	410.
5.000	1.082	1.178	2.31	273.92	1.33	.40	248.17	8.13	1.62	409.	410.
6.000	.613	.733	2.66	268.01	1.36	.08	241.81	7.77	1.86	407.	410.
7.000	.332	.395	2.87	261.92	1.33	.00	235.76	7.23	1.77	406.	409.
8.000	.167	.219	3.26	255.46	1.20	.01	228.96	6.94	1.93	404.	406.
9.000	.085	.124	3.44	248.26	1.14	-.23	222.20	7.29	1.76	401.	405.
10.000	.043	.061	2.37	240.64	1.19	-.01	215.65	8.11	1.26	384.	402.
11.000	.021	.029	2.33	232.72	1.18	.01	210.16	8.13	.89	139.	399.
12.000	99.999	99.999	999.99	224.56	1.20	.15	999.99	99.99	999.99	0.	398.
13.000	99.999	99.999	999.99	216.45	1.29	-.02	999.99	99.99	999.99	0.	395.
14.000	99.999	99.999	999.99	208.51	1.45	-.19	999.99	99.99	999.99	0.	395.
15.000	99.999	99.999	999.99	201.00	1.47	-.26	999.99	99.99	999.99	0.	[illegible]
16.000	99.999	99.999	999.99	194.12	1.67	-.11	999.99	99.99	999.99	0.	369.
17.000	99.999	99.999	999.99	189.62	2.15	-.41	999.99	99.99	999.99	0.	360.
18.000	99.999	99.999	999.99	191.10	2.90	.23	999.99	99.99	999.99	0.	352.
19.000	99.999	99.999	999.99	198.02	2.95	.13	999.99	99.99	999.99	0.	336.
20.000	99.999	99.999	999.99	204.35	2.72	-.16	999.99	99.99	999.99	0.	332.
21.000	99.999	99.999	999.99	208.11	2.40	-.57	999.99	99.99	999.99	0.	256.
22.000	99.999	99.999	999.99	211.40	2.47	-.33	999.99	99.99	999.99	0.	250.
23.000	99.999	99.999	999.99	214.24	2.56	-.21	999.99	99.99	999.99	0.	247.
24.000	99.999	99.999	999.99	216.74	2.35	-.29	999.99	99.99	999.99	0.	307.
25.000	99.999	99.999	999.99	218.74	2.26	.12	999.99	99.99	999.99	0.	303.
26.000	99.999	99.999	999.99	220.70	2.15	.09	999.99	99.99	999.99	0.	300.
27.000	99.999	99.999	999.99	222.51	2.10	.66	999.99	99.99	999.99	0.	223.
28.000	99.999	99.999	999.99	224.32	2.04	.12	999.99	99.99	999.99	0.	191.
29.000	99.999	99.999	999.99	226.09	2.49	.30	999.99	99.99	999.99	0.	171.
30.000	99.999	99.999	999.99	227.59	2.44	.33	999.99	99.99	999.99	0.	167.

TABLE III. 2 MOISTURE RELATED STATISTICAL PARAMETERS, FEBRUARY
STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	26.788	2.324	-.60	301.65	1.43	-.30	295.31	1.47	-.91	376.	376.
.111	25.842	2.234	-.63	300.96	1.35	-.26	294.73	1.46	-.95	376.	377.
1.000	17.531	2.879	-.82	294.26	1.14	-.45	288.37	2.86	-1.60	377.	377.
2.000	9.290	4.252	-.10	288.90	1.56	-.57	277.32	8.04	-.76	378.	378.
3.000	3.506	2.898	1.28	284.95	1.65	-.09	262.53	9.28	.73	378.	378.
4.000	1.761	1.567	2.10	279.85	1.61	-.07	254.52	7.74	1.32	378.	378.
5.000	.970	.950	2.87	274.16	1.63	-.27	247.81	6.91	1.81	378.	378.
6.000	.527	.569	3.16	268.28	1.39	-.34	241.14	6.54	2.14	375.	377.
7.000	.264	.306	3.85	261.83	1.19	-.37	234.29	5.91	2.48	372.	374.
8.000	.126	.141	4.54	255.13	1.08	-.23	227.59	5.36	2.23	364.	366.
9.000	.067	.092	3.97	247.98	1.15	.01	220.98	6.29	1.96	364.	366.
10.000	.032	.047	3.30	240.28	1.16	-.06	214.10	7.05	1.51	354.	364.
11.000	.019	.024	2.72	232.31	1.19	-.15	209.64	7.67	.77	78.	362.
12.000	99.999	99.999	999.99	224.17	1.20	-.16	999.99	99.99	999.99	1.	360.
13.000	99.999	99.999	999.99	216.09	1.28	-.15	999.99	99.99	999.99	0.	355.
14.000	99.999	99.999	999.99	208.12	1.46	-.15	999.99	99.99	999.99	0.	353.
15.000	99.999	99.999	999.99	200.61	1.38	-.15	999.99	99.99	999.99	0.	349.
16.000	99.999	99.999	999.99	193.97	1.56	.04	999.99	99.99	999.99	0.	346.
17.000	99.999	99.999	999.99	190.84	1.98	-.28	999.99	99.99	999.99	0.	324.
18.000	99.999	99.999	999.99	192.56	2.55	.43	999.99	99.99	999.99	0.	319.
19.000	99.999	99.999	999.99	198.03	2.90	.03	999.99	99.99	999.99	0.	317.
20.000	99.999	99.999	999.99	203.29	2.80	.08	999.99	99.99	999.99	0.	315.
21.000	99.999	99.999	999.99	207.61	2.57	-.25	999.99	99.99	999.99	0.	251.
22.000	99.999	99.999	999.99	211.02	2.78	-.41	999.99	99.99	999.99	0.	250.
23.000	99.999	99.999	999.99	213.80	2.29	-.27	999.99	99.99	999.99	0.	245.
24.000	99.999	99.999	999.99	216.45	2.01	-.14	999.99	99.99	999.99	0.	293.
25.000	99.999	99.999	999.99	218.64	2.00	-.07	999.99	99.99	999.99	0.	288.
26.000	99.999	99.999	999.99	220.73	2.09	-.23	999.99	99.99	999.99	0.	286.
27.000	99.999	99.999	999.99	222.77	2.36	.11	999.99	99.99	999.99	0.	215.
28.000	99.999	99.999	999.99	225.05	2.49	.14	999.99	99.99	999.99	0.	188.
29.000	99.999	99.999	999.99	227.10	2.39	-.05	999.99	99.99	999.99	0.	165.
30.000	99.999	99.999	999.99	223.05	2.59	.01	999.99	99.99	999.99	0.	161.

TABLE III. 3 MOISTURE RELATED STATISTICAL PARAMETERS, MARCH

STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	27.164	2.170	-.23	302.08	1.49	-.23	295.55	1.34	-.50	398.	398.
.111	26.197	2.071	-.24	301.38	1.39	-.23	294.96	1.32	-.52	398.	398.
1.000	17.500	2.907	-.70	294.48	1.06	-.14	288.34	2.85	-1.37	414.	416.
2.000	9.241	4.534	-.14	289.14	1.43	-.28	276.90	8.85	-.74	416.	416.
3.000	4.091	3.431	.98	284.98	1.57	.16	263.93	10.41	.52	416.	416.
4.000	1.934	1.927	1.83	279.86	1.61	-.08	255.30	8.81	1.20	415.	416.
5.000	1.128	1.225	2.36	274.25	1.51	-.08	248.66	8.13	1.63	415.	416.
6.000	.569	.675	2.93	268.37	1.27	-.21	241.39	7.18	2.15	412.	415.
7.000	.296	.394	3.61	262.09	1.09	-.12	234.84	6.56	2.45	411.	413.
8.000	.156	.222	3.42	255.49	1.10	-.04	228.29	6.66	2.40	409.	410.
9.000	.077	.117	3.45	248.35	1.14	-.02	221.50	6.88	2.09	408.	409.
10.000	.039	.060	2.85	240.74	1.18	-.01	214.95	7.64	1.57	389.	404.
11.000	.025	.032	1.96	232.81	1.25	.00	211.11	8.60	.70	149.	402.
12.000	99.999	99.999	999.99	224.61	1.29	-.19	999.99	99.99	999.99	2.	402.
13.000	99.999	99.999	999.99	216.48	1.36	-.21	999.99	99.99	999.99	2.	399.
14.000	99.999	99.999	999.99	208.45	1.45	.15	999.99	99.99	999.99	2.	399.
15.000	99.999	99.999	999.99	200.90	1.41	.14	999.99	99.99	999.99	2.	395.
16.000	99.999	99.999	999.99	194.08	1.66	-.21	999.99	99.99	999.99	0.	394.
17.000	99.999	99.999	999.99	190.06	2.18	-.24	999.99	99.99	999.99	0.	371.
18.000	99.999	99.999	999.99	192.35	2.64	.04	999.99	99.99	999.99	0.	364.
19.000	99.999	99.999	999.99	198.32	2.39	.06	999.99	99.99	999.99	0.	352.
20.000	99.999	99.999	999.99	203.63	2.34	.32	999.99	99.99	999.99	0.	350.
21.000	99.999	99.999	999.99	208.05	2.11	.20	999.99	99.99	999.99	0.	281.
22.000	99.999	99.999	999.99	211.29	2.28	.11	999.99	99.99	999.99	0.	279.
23.000	99.999	99.999	999.99	214.42	2.00	-.28	999.99	99.99	999.99	0.	279.
24.000	99.999	99.999	999.99	217.15	2.02	.11	999.99	99.99	999.99	0.	330.
25.000	99.999	99.999	999.99	219.46	2.13	.14	999.99	99.99	999.99	0.	329.
26.000	99.999	99.999	999.99	221.93	2.09	.05	999.99	99.99	999.99	0.	328.
27.000	99.999	99.999	999.99	224.15	2.20	-.22	999.99	99.99	999.99	0.	228.
28.000	99.999	99.999	999.99	226.27	2.36	-.18	999.99	99.99	999.99	0.	197.
29.000	99.999	99.999	999.99	227.87	2.69	-.20	999.99	99.99	999.99	0.	174.
30.000	99.999	99.999	999.99	229.03	2.70	.01	999.99	99.99	999.99	0.	182.

TABLE III. 4 MOISTURE RELATED STATISTICAL PARAMETERS, APRIL

STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	28.303	1.786	.09	302.96	1.35	-.15	296.25	1.05	-.07	388.	388.
.111	27.267	1.721	.08	302.22	1.28	-.19	295.63	1.04	-.09	391.	391.
1.000	18.218	2.882	-.78	295.15	.94	.11	288.99	2.72	-1.37	396.	399.
2.000	9.718	4.253	-.14	289.57	1.25	-.13	278.14	7.63	-.76	396.	399.
3.000	4.233	3.178	.88	284.65	1.24	-.60	265.01	9.68	.35	398.	399.
4.000	1.925	1.764	1.85	279.47	1.34	.21	255.22	8.35	1.20	396.	393.
5.000	.981	1.076	2.91	273.93	1.26	.09	247.55	7.27	2.04	395.	399.
6.000	.511	.649	3.82	268.14	1.17	-.26	240.57	6.52	2.73	397.	390.
7.000	.281	.409	4.07	261.81	1.18	-.08	234.13	6.48	2.80	396.	398.
8.000	.167	.261	3.36	255.12	1.25	-.28	228.19	7.33	2.34	397.	397.
9.000	.085	.131	3.08	247.99	1.30	-.22	221.75	7.66	1.82	395.	396.
10.000	.043	.072	2.61	240.39	1.34	-.24	214.78	8.44	1.64	371.	396.
11.000	.026	.034	1.65	232.40	1.36	-.23	210.51	9.34	.83	108.	396.
12.000	99.999	99.999	999.99	224.37	1.17	-.03	999.99	99.99	999.99	1.	394.
13.000	99.999	99.999	999.99	216.38	1.16	.07	999.99	99.99	999.99	0.	393.
14.000	99.999	99.999	999.99	208.51	1.23	.39	999.99	99.99	999.99	0.	393.
15.000	99.999	99.999	999.99	201.31	1.33	.08	999.99	99.99	999.99	0.	390.
16.000	99.999	99.999	999.99	195.27	1.71	-.13	999.99	99.99	999.99	0.	390.
17.000	99.999	99.999	999.99	191.95	2.02	-.24	999.99	99.99	999.99	0.	369.
18.000	99.999	99.999	999.99	192.86	2.24	.35	999.99	99.99	999.99	0.	362.
19.000	99.999	99.999	999.99	198.51	2.28	.34	999.99	99.99	999.99	0.	351.
20.000	99.999	99.999	999.99	204.73	2.35	-.09	999.99	99.99	999.99	0.	348.
21.000	99.999	99.999	999.99	209.38	2.04	.21	999.99	99.99	999.99	0.	282.
22.000	99.999	99.999	999.99	212.72	2.17	.04	999.99	99.99	999.99	0.	279.
23.000	99.999	99.999	999.99	215.66	2.05	.72	999.99	99.99	999.99	0.	276.
24.000	99.999	99.999	999.99	218.51	2.01	.97	999.99	99.99	999.99	0.	315.
25.000	99.999	99.999	999.99	221.31	2.16	.82	999.99	99.99	999.99	0.	321.
26.000	99.999	99.999	999.99	223.95	2.34	.35	999.99	99.99	999.99	0.	316.
27.000	99.999	99.999	999.99	226.65	2.17	.23	999.99	99.99	999.99	0.	218.
28.000	99.999	99.999	999.99	228.45	2.22	.01	999.99	99.99	999.99	0.	191.
29.000	99.999	99.999	999.99	230.28	2.48	.17	999.99	99.99	999.99	0.	167.
30.000	99.999	99.999	999.99	232.33	2.55	-.26	999.99	99.99	999.99	0.	154.

TABLE III. 5 MOISTURE RELATED STATISTICAL PARAMETERS, MAY

STATION = 912170 TAGUAC

Z	VAPOR P	S.D. VP	SKEW VP	TV	TV	SKEW TV	DEWPT T	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
	MEAN			MEAN	S.D.		MEAN				
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	29.375	2.024	.12	303.58	1.66	-.03	296.86	1.15	-.18	396.	396.
.111	28.330	1.953	.05	302.85	1.56	-.02	296.26	1.15	-.24	400.	402.
1.000	19.155	2.459	-.74	296.02	1.02	-.29	289.85	2.16	-1.17	402.	406.
2.000	10.764	3.620	-.43	290.30	1.12	-.12	280.25	6.03	-1.22	402.	406.
3.000	5.867	3.115	.04	285.05	1.00	.18	270.37	8.82	-.55	402.	406.
4.000	3.089	2.285	.66	279.25	1.00	.27	260.79	9.90	.16	397.	405.
5.000	1.697	1.502	1.09	273.51	1.23	.13	252.89	9.95	.51	399.	405.
6.000	.844	.836	1.50	267.76	1.18	-.11	244.86	9.26	.84	396.	403.
7.000	.401	.473	2.35	261.50	1.13	-.11	237.00	8.35	1.33	393.	403.
8.000	.197	.259	2.60	254.90	1.28	-.18	229.65	8.17	1.48	394.	401.
9.000	.098	.141	2.42	247.76	1.38	-.17	222.59	8.44	1.46	394.	400.
10.000	.048	.071	1.96	240.10	1.34	-.15	215.52	9.00	1.28	370.	399.
11.000	.026	.035	1.35	232.18	1.33	.01	210.19	9.62	.92	82.	399.
12.000	99.999	99.999	999.99	224.01	1.27	.06	999.99	99.99	999.99	0.	397.
13.000	99.999	99.999	999.99	215.97	1.28	.25	999.99	99.99	999.99	0.	394.
14.000	99.999	99.999	999.99	208.22	1.41	.37	999.99	99.99	999.99	0.	394.
15.000	99.999	99.999	999.99	201.47	1.57	.13	999.99	99.99	999.99	0.	392.
16.000	99.999	99.999	999.99	196.02	1.85	-.04	999.99	99.99	999.99	0.	391.
17.000	99.999	99.999	999.99	193.53	1.92	-.03	999.99	99.99	999.99	0.	359.
18.000	99.999	99.999	999.99	195.18	2.44	.15	999.99	99.99	999.99	0.	354.
19.000	99.999	99.999	999.99	200.93	2.70	.15	999.99	99.99	999.99	0.	340.
20.000	99.999	99.999	999.99	206.98	2.30	.06	999.99	99.99	999.99	0.	335.
21.000	99.999	99.999	999.99	210.75	1.89	-.07	999.99	99.99	999.99	0.	251.
22.000	99.999	99.999	999.99	213.75	1.84	.06	999.99	99.99	999.99	0.	251.
23.000	99.999	99.999	999.99	216.74	2.03	-.04	999.99	99.99	999.99	0.	250.
24.000	99.999	99.999	999.99	219.52	2.01	.52	999.99	99.99	999.99	0.	274.
25.000	99.999	99.999	999.99	221.84	1.98	.11	999.99	99.99	999.99	0.	310.
26.000	99.999	99.999	999.99	224.29	2.16	-.71	999.99	99.99	999.99	0.	305.
27.000	99.999	99.999	999.99	226.26	2.16	-.63	999.99	99.99	999.99	0.	205.
28.000	99.999	99.999	999.99	228.48	2.10	.24	999.99	99.99	999.99	0.	182.
29.000	99.999	99.999	999.99	230.57	2.27	-.28	999.99	99.99	999.99	0.	151.
30.000	99.999	99.999	999.99	232.16	2.32	.01	999.99	99.99	999.99	0.	139.

TABLE III. 6 MOISTURE RELATED STATISTICAL PARAMETERS, JUNE

STATION = 912170 TAGUAC

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	30.273	1.614	.65	303.86	1.72	-.12	297.38	.88	.34	401.	401.
.111	29.171	1.518	.59	303.12	1.62	-.12	296.76	.86	.29	404.	407.
1.000	19.772	2.464	-.86	296.52	.75	-.21	290.36	2.12	-1.33	405.	409.
2.000	12.117	3.156	-.81	290.50	.89	-.05	282.36	4.82	-1.81	407.	410.
3.000	6.829	2.935	-.21	285.05	.96	.36	273.17	7.43	-.91	405.	409.
4.000	3.788	2.223	.25	279.20	.94	-.10	264.29	8.95	-.36	404.	409.
5.000	2.321	1.663	.53	273.23	1.02	-.18	257.22	9.97	-.10	406.	409.
6.000	1.197	1.092	1.01	267.49	1.14	-.15	248.32	10.57	.33	407.	409.
7.000	.617	.636	1.28	261.38	1.07	-.29	240.64	10.30	.58	404.	408.
8.000	.328	.358	1.25	254.81	1.13	-.23	233.59	10.50	.58	404.	407.
9.000	.169	.194	1.18	247.63	1.25	-.16	226.68	10.68	.56	403.	406.
10.000	.082	.090	1.01	239.91	1.25	-.06	219.93	10.84	.34	381.	406.
11.000	.035	.042	.96	231.83	1.27	-.19	212.25	10.72	.54	47.	406.
12.000	99.999	99.999	999.99	223.53	1.26	-.03	999.99	99.99	999.99	0.	404.
13.000	99.999	99.999	999.99	215.32	1.35	.10	999.99	99.99	999.99	0.	404.
14.000	99.999	99.999	999.99	207.35	1.55	-.03	999.99	99.99	999.99	0.	404.
15.000	99.999	99.999	999.99	200.53	1.77	.06	999.99	99.99	999.99	0.	398.
16.000	99.999	99.999	999.99	195.76	2.24	-.36	999.99	99.99	999.99	0.	395.
17.000	99.999	99.999	999.99	196.00	2.34	.21	999.99	99.99	999.99	0.	363.
18.000	99.999	99.999	999.99	199.58	2.34	.25	999.99	99.99	999.99	0.	360.
19.000	99.999	99.999	999.99	204.33	2.06	.16	999.99	99.99	999.99	0.	349.
20.000	99.999	99.999	999.99	208.42	1.99	.07	999.99	99.99	999.99	0.	345.
21.000	99.999	99.999	999.99	211.58	1.82	.10	999.99	99.99	999.99	0.	253.
22.000	99.999	99.999	999.99	214.43	1.95	-.05	999.99	99.99	999.99	0.	250.
23.000	99.999	99.999	999.99	216.89	1.81	.06	999.99	99.99	999.99	0.	247.
24.000	99.999	99.999	999.99	219.32	1.68	-.02	999.99	99.99	999.99	0.	260.
25.000	99.999	99.999	999.99	221.72	1.81	-.05	999.99	99.99	999.99	0.	321.
26.000	99.999	99.999	999.99	223.78	1.91	-.85	999.99	99.99	999.99	0.	320.
27.000	99.999	99.999	999.99	225.70	1.83	-.26	999.99	99.99	999.99	0.	216.
28.000	99.999	99.999	999.99	227.82	2.05	.06	999.99	99.99	999.99	0.	181.
29.000	99.999	99.999	999.99	229.31	2.41	-.48	999.99	99.99	999.99	0.	150.
30.000	99.999	99.999	999.99	230.61	2.49	.04	999.99	99.99	999.99	0.	124.

TABLE III. 7 MOISTURE RELATED STATISTICAL PARAMETERS, JULY

STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	30.894	1.826	.92	303.63	1.94	-.03	297.71	.97	.65	420.	420.
.111	29.788	1.690	.96	302.91	1.83	-.04	297.10	.93	.68	420.	420.
1.000	20.379	2.200	-1.07	296.69	.75	-.46	290.86	1.85	-1.68	421.	421.
2.000	13.042	2.098	-.83	290.65	.88	-.08	283.86	2.68	-1.48	423.	423.
3.000	8.106	2.239	-.89	285.11	.88	-.44	276.43	5.08	-1.92	422.	423.
4.000	5.106	1.982	-.57	279.07	.83	-.19	269.37	7.05	-1.40	422.	423.
5.000	3.212	1.593	-.25	273.11	.86	.16	262.53	8.57	-.99	423.	423.
6.000	1.822	1.188	.18	267.39	.98	-.11	254.32	10.25	-.55	416.	420.
7.000	1.004	.771	.38	261.32	1.12	-.07	246.52	10.99	-.26	414.	418.
8.000	.515	.437	.51	254.80	1.19	-.25	238.64	11.34	-.15	413.	416.
9.000	.233	.227	.72	247.68	1.22	-.36	229.85	11.47	.09	412.	416.
10.000	.102	.103	.68	239.99	1.26	-.06	221.72	11.47	.11	398.	415.
11.000	.069	.045	-.27	231.83	1.30	-.09	220.57	10.10	-.86	63.	414.
12.000	99.999	99.999	999.99	223.41	1.30	-.08	999.99	99.99	999.99	0.	413.
13.000	99.999	99.999	999.99	215.07	1.38	.02	999.99	99.99	999.99	0.	412.
14.000	99.999	99.999	999.99	206.95	1.61	.37	999.99	99.99	999.99	0.	403.
15.000	99.999	99.999	999.99	199.79	1.82	.32	999.99	99.99	999.99	0.	400.
16.000	99.999	99.999	999.99	195.11	2.56	.20	999.99	99.99	999.99	0.	395.
17.000	99.999	99.999	999.99	197.85	2.60	-.56	999.99	99.99	999.99	0.	360.
18.000	99.999	99.999	999.99	201.69	1.86	-.15	999.99	99.99	999.99	0.	356.
19.000	99.999	99.999	999.99	205.57	1.81	-.15	999.99	99.99	999.99	0.	346.
20.000	99.999	99.999	999.99	208.93	1.88	.03	999.99	99.99	999.99	0.	344.
21.000	99.999	99.999	999.99	211.78	1.66	.06	999.99	99.99	999.99	0.	227.
22.000	99.999	99.999	999.99	214.15	1.92	-.01	999.99	99.99	999.99	0.	221.
23.000	99.999	99.999	999.99	216.45	1.92	.11	999.99	99.99	999.99	0.	217.
24.000	99.999	99.999	999.99	218.83	1.89	.43	999.99	99.99	999.99	0.	222.
25.000	99.999	99.999	999.99	220.88	1.82	.09	999.99	99.99	999.99	0.	298.
26.000	99.999	99.999	999.99	222.90	1.99	.10	999.99	99.99	999.99	0.	294.
27.000	99.999	99.999	999.99	224.72	1.97	.00	999.99	99.99	999.99	0.	222.
28.000	99.999	99.999	999.99	226.79	2.17	.08	999.99	99.99	999.99	0.	189.
29.000	99.999	99.999	999.99	228.24	2.47	-.18	999.99	99.99	999.99	0.	155.
30.000	99.999	99.999	999.99	[illegible]	2.68	.00	999.99	99.99	999.99	0.	123.

TABLE III. 8 MOISTURE RELATED STATISTICAL PARAMETERS, AUGUST

STATION = 912170 TAGUAC

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	30.918	1.490	-.16	303.37	1.84	.20	297.73	.81	-.32	417.	417.
.111	29.836	1.365	-.16	302.66	1.75	.15	297.14	.77	-.32	417.	418.
1.000	20.585	2.066	-.51	296.72	.88	-.68	291.04	1.65	-.84	419.	419.
2.000	13.515	1.999	-.81	290.74	.91	-.21	284.43	2.45	-1.48	421.	421.
3.000	8.700	1.989	-.82	285.11	.93	.07	277.69	3.99	-1.98	421.	421.
4.000	5.672	1.826	-.84	279.17	.89	.23	271.21	5.91	-1.76	418.	421.
5.000	3.768	1.518	-.52	273.28	.93	-.08	265.28	7.13	-1.42	419.	421.
6.000	2.243	1.136	-.21	267.57	1.05	-.01	257.92	8.78	-1.15	419.	421.
7.000	1.266	.748	-.02	261.57	1.17	.06	250.46	9.58	-.85	415.	418.
8.000	.632	.444	.17	255.10	1.32	.14	241.85	10.50	-.55	415.	417.
9.000	.296	.228	.31	247.98	1.43	.09	233.59	10.64	-.42	413.	416.
10.000	.132	.104	.29	240.30	1.53	-.05	225.56	10.76	-.46	401.	415.
11.000	.070	.047	-.13	232.14	1.58	-.08	220.56	10.27	-.84	101.	415.
12.000	99.999	99.999	999.99	223.67	1.59	-.25	999.99	99.99	999.99	0.	414.
13.000	99.999	99.999	999.99	215.22	1.61	-.29	999.99	99.99	999.99	0.	413.
14.000	99.999	99.999	999.99	206.94	1.61	-.03	999.99	99.99	999.99	0.	413.
15.000	99.999	99.999	999.99	199.69	1.71	.19	999.99	99.99	999.99	0.	408.
16.000	99.999	99.999	999.99	195.22	2.81	.39	999.99	99.99	999.99	0.	405.
17.000	99.999	99.999	999.99	197.94	2.72	-.78	999.99	99.99	999.99	0.	368.
18.000	99.999	99.999	999.99	201.82	2.07	-.16	999.99	99.99	999.99	0.	358.
19.000	99.999	99.999	999.99	205.67	1.94	.10	999.99	99.99	999.99	0.	351.
20.000	99.999	99.999	999.99	208.72	1.88	.04	999.99	99.99	999.99	0.	348.
21.000	99.999	99.999	999.99	211.62	1.75	.25	999.99	99.99	999.99	0.	254.
22.000	99.999	99.999	999.99	213.97	1.83	-.05	999.99	99.99	999.99	0.	245.
23.000	99.999	99.999	999.99	215.89	1.89	.02	999.99	99.99	999.99	0.	240.
24.000	99.999	99.999	999.99	217.74	1.95	.53	999.99	99.99	999.99	0.	251.
25.000	99.999	99.999	999.99	219.70	2.01	.65	999.99	99.99	999.99	0.	294.
26.000	99.999	99.999	999.99	221.88	2.20	.17	999.99	99.99	999.99	0.	290.
27.000	99.999	99.999	999.99	223.80	2.31	.08	999.99	99.99	999.99	0.	187.
28.000	99.999	99.999	999.99	225.70	2.39	.18	999.99	99.99	999.99	0.	148.
29.000	99.999	99.999	999.99	227.26	2.44	.03	999.99	99.99	999.99	0.	114.
30.000	99.999	99.999	999.99	228.53	2.52	-.29	999.99	99.99	999.99	0.	101.

TABLE III. 9 MOISTURE RELATED STATISTICAL PARAMETERS, SEPTEMBER
STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	30.969	1.737	-.39	303.54	1.09	-.13	297.75	.95	-.60	398.	398.
.111	29.888	1.606	-.38	302.84	1.78	-.13	297.16	.91	-.59	399.	399.
1.000	20.622	2.180	-.63	296.89	.85	-.38	291.06	1.76	-1.04	400.	401.
2.000	13.595	2.013	-.62	290.96	.94	.44	284.52	2.41	-1.19	402.	403.
3.000	8.550	2.081	-.63	285.33	1.00	.14	277.40	4.12	-1.59	402.	403.
4.000	5.422	1.879	-.56	279.29	.93	.08	270.52	6.06	-1.45	402.	403.
5.000	3.475	1.542	-.29	273.24	1.02	.06	263.99	7.65	-1.20	403.	403.
6.000	2.038	1.150	-.09	267.45	1.11	.03	256.22	9.67	-.92	402.	403.
7.000	1.088	.745	.19	261.39	1.17	.27	248.00	10.49	-.53	402.	403.
8.000	.572	.421	.28	254.87	1.26	.31	240.57	10.67	-.45	401.	403.
9.000	.270	.214	.35	247.76	1.39	.02	232.56	10.62	-.33	399.	402.
10.000	.115	.098	.39	240.14	1.46	.02	223.83	10.94	-.24	383.	400.
11.000	.071	.044	-.41	232.01	1.48	-.03	220.88	10.11	-.97	76.	400.
12.000	99.999	99.939	999.99	223.56	1.42	-.06	999.99	99.99	999.99	0.	399.
13.000	99.999	99.999	999.99	215.18	1.43	-.08	999.99	99.99	999.99	0.	397.
14.000	99.999	99.999	999.99	207.06	1.57	.08	999.99	99.99	999.99	0.	393.
15.000	99.999	99.999	999.99	200.00	1.70	.46	999.99	99.99	999.99	0.	391.
16.000	99.999	99.999	999.99	195.36	2.49	-.16	999.99	99.99	999.99	0.	388.
17.000	99.999	99.999	999.99	196.47	2.80	-.52	999.99	99.99	999.99	0.	344.
18.000	99.999	99.999	999.99	200.30	2.10	-.01	999.99	99.99	999.99	0.	334.
19.000	99.999	99.999	999.99	204.38	2.00	-.38	999.99	99.99	999.99	0.	323.
20.000	99.999	99.999	999.99	207.76	1.79	.14	999.99	99.99	999.99	0.	321.
21.000	99.999	99.999	999.99	210.90	1.78	.15	999.99	99.99	999.99	0.	226.
22.000	99.999	99.999	999.99	213.12	2.01	.04	999.99	99.99	999.99	0.	220.
23.000	99.999	99.999	999.99	215.16	1.85	.09	999.99	99.99	999.99	0.	216.
24.000	99.999	99.999	999.99	217.22	1.94	-.03	999.99	99.99	999.99	0.	239.
25.000	99.999	99.999	999.99	219.63	1.82	-.06	999.99	99.99	999.99	0.	286.
26.000	99.999	99.999	999.99	221.74	2.00	-.17	999.99	99.99	999.99	0.	205.
27.000	99.999	99.999	999.99	223.95	2.04	.06	999.99	99.99	999.99	0.	183.
28.000	99.999	99.999	999.99	226.07	2.14	.15	999.99	99.99	999.99	0.	149.
29.000	99.999	99.999	999.99	228.38	2.44	-.16	999.99	99.99	999.99	0.	127.
30.000	99.999	99.999	999.99	229.63	2.49	-.07	999.99	99.99	999.99	0.	125.

TABLE III. 10 MOISTURE RELATED STATISTIC PARAMETERS, OCTOBER

STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K			
.000	31.106	1.657	.07	303.61	1.78	-.10	297.83	.89	-.16	406.	406.
.111	30.006	1.554	.06	302.90	1.69	-.13	297.23	.87	-.17	407.	407.
1.000	20.656	2.350	-.97	296.85	.85	-.45	291.07	1.95	-1.62	409.	410.
2.000	13.256	2.666	-.96	290.87	.92	.04	283.96	3.60	-1.92	410.	411.
3.000	8.177	2.608	-.60	285.34	.95	-.19	276.36	5.74	-1.52	410.	411.
4.000	4.819	2.270	-.23	279.49	1.02	.38	268.08	8.12	-.90	410.	411.
5.000	2.928	1.762	.10	273.57	1.09	.35	260.62	9.71	-.58	406.	411.
6.000	1.706	1.294	.42	267.86	1.20	.33	252.73	11.11	-.22	407.	410.
7.000	.949	.804	.62	261.67	1.40	.09	245.46	11.25	-.05	407.	409.
8.000	.523	.455	.66	255.08	1.59	.19	238.80	11.27	-.12	403.	407.
9.000	.260	.243	.72	247.93	1.75	.23	231.21	11.42	-.04	402.	405.
10.000	.115	.109	.72	240.21	1.83	.47	223.28	11.41	-.11	384.	404.
11.000	.072	.051	-.02	232.19	1.85	.59	220.40	10.72	-.73	109.	402.
12.000	99.999	99.999	999.99	223.87	1.61	.05	999.99	99.99	999.99	1.	401.
13.000	99.999	99.999	999.99	215.63	1.53	.04	999.99	99.99	999.99	0.	400.
14.000	99.999	99.999	999.99	207.62	1.60	.23	999.99	99.99	999.99	0.	400.
15.000	99.999	99.999	999.99	200.76	1.78	.24	999.99	99.89	999.99	1.	398.
16.000	99.999	99.999	999.99	195.22	2.26	.07	999.99	99.99	999.99	0.	394.
17.000	99.999	99.999	999.99	193.51	2.58	.01	999.39	99.99	999.99	0.	341.
18.000	99.999	99.999	999.99	196.81	3.05	-.25	999.99	99.99	999.99	0.	328.
19.000	99.999	99.999	999.99	202.42	2.51	-.22	999.99	99.99	999.99	0.	305.
20.000	99.999	99.999	999.99	206.53	2.23	-.33	999.99	99.99	999.99	0.	302.
21.000	99.999	99.999	999.99	210.19	1.81	-.15	999.99	99.99	999.99	0.	230.
22.000	99.999	99.999	999.99	213.15	2.17	-.01	999.99	99.99	999.99	0.	226.
23.000	99.999	99.999	999.99	215.18	2.12	-.13	999.99	99.99	999.99	0.	224.
24.000	99.999	99.999	999.99	217.53	2.18	.10	999.99	99.99	999.99	0.	248.
25.000	99.999	99.999	999.99	220.07	2.06	.25	999.99	99.99	999.99	0.	265.
26.000	99.999	99.999	999.99	222.80	2.14	.07	999.99	99.99	999.99	0.	264.
27.000	99.999	99.999	999.99	225.12	2.16	-.01	999.99	99.99	999.99	0.	191.
28.000	99.999	99.999	999.99	227.13	2.60	-.42	999.99	99.99	999.99	0.	170.
29.000	99.999	99.999	999.99	229.21	2.84	-1.07	999.99	99.99	999.99	0.	137.
30.000	99.999	99.999	999.99	231.29	2.55	-.07	999.99	99.99	999.99	0.	117.

TABLE III. 11 MOISTURE RELATED STATISTICAL PARAMETERS, NOVEMBER
STATION = 912170 TAGUAC

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	30.629	1.733	-.54	303.57	1.47	-.33	297.57	.96	-.72	397.	397.
.111	29.570	1.628	-.58	302.88	1.39	-.33	296.98	.93	-.77	397.	398.
1.000	20.228	2.457	-.85	296.56	.81	-.30	290.72	2.06	-1.27	401.	401.
2.000	11.851	3.956	-.85	290.85	.98	-.31	281.55	6.60	-1.54	401.	401.
3.000	6.753	3.599	-.18	285.47	.98	-.47	272.03	9.58	-.67	400.	401.
4.000	3.850	2.491	.25	279.80	.99	.37	263.91	9.95	-.23	400.	401.
5.000	2.233	1.857	.68	273.97	1.07	.18	255.84	10.97	.20	401.	401.
6.000	1.278	1.216	.93	268.06	1.16	-.06	248.54	11.21	.40	401.	401.
7.000	.659	.759	1.35	261.89	1.32	-.22	240.48	10.99	.79	400.	400.
8.000	.337	.427	1.54	255.29	1.47	-.44	233.07	10.82	.91	396.	397.
9.000	.161	.216	1.59	248.19	1.63	-.17	225.57	10.66	.93	394.	395.
10.000	.078	.102	1.40	240.61	1.62	-.14	218.69	10.81	.75	372.	392.
11.000	.049	.052	.61	232.68	1.59	-.30	214.75	11.60	.22	134.	392.
12.000	99.999	99.999	999.99	224.53	1.42	-.29	999.99	99.99	999.99	0.	390.
13.000	99.999	99.999	999.99	216.45	1.38	-.07	999.99	99.99	999.99	0.	387.
14.000	99.999	99.999	999.99	208.51	1.50	.18	999.99	99.99	999.99	0.	387.
15.000	99.999	99.999	999.99	201.22	1.64	.12	999.99	99.99	999.99	0.	381.
16.000	99.999	99.999	999.99	194.79	2.03	-.30	999.99	99.99	999.99	0.	380.
17.000	99.999	99.999	999.99	191.36	2.07	-.03	999.99	99.99	999.99	0.	350.
18.000	99.999	99.999	999.99	193.13	2.95	.26	999.99	99.99	999.99	0.	343.
19.000	99.999	99.999	999.99	199.46	2.94	-.01	999.99	99.99	999.99	0.	319.
20.000	99.999	99.999	999.99	205.38	2.35	-.27	999.99	99.99	999.99	0.	317.
21.000	99.999	99.999	999.99	209.31	2.11	.01	999.99	99.99	999.99	0.	249.
22.000	99.999	99.999	999.99	212.31	2.30	-.11	999.99	99.99	999.99	0.	248.
23.000	99.999	99.999	999.99	215.21	2.23	.04	999.99	99.99	999.99	0.	248.
24.000	99.999	99.999	999.99	217.87	2.07	.34	999.99	99.99	999.99	0.	283.
25.000	99.999	99.999	999.99	220.49	2.31	.35	999.99	99.99	999.99	0.	287.
26.000	99.999	99.999	999.99	223.08	2.31	.32	999.99	99.99	999.99	0.	267.
27.000	99.999	99.999	999.99	225.16	2.58	.18	999.99	99.99	999.99	0.	210.
28.000	99.999	99.999	999.99	227.35	2.70	-.09	999.99	99.99	999.99	0.	176.
29.000	99.999	99.999	999.99	229.45	2.83	-.58	999.99	99.99	999.99	0.	155.
30.000	99.999	99.999	999.99	230.83	2.56	-.58	999.99	99.99	999.99	0.	145.

TABLE III. 12 MOISTURE RELATED STATISTICAL PARAMETERS, DECEMBER

STATION = 912170 TAGUAC

Z	VAPOR P MEAN	S.D. VP	SKEW VP	TV MEAN	TV S.D.	SKEW TV	DEWPT T MEAN	S.D. DPT	SKEW DPT	NOBS T+P	NOBS TV
KM	MB	MB		DEG K	DEG K		DEG K	DEG K	.		
.000	28.970	2.097	-.28	302.85	1.38	-.51	296.62	1.22	-.54	420.	420.
.111	27.978	2.016	-.25	302.18	1.31	-.46	296.05	1.21	-.50	422.	424.
1.000	18.725	2.974	-1.16	295.65	1.06	.05	289.40	2.88	-2.09	423.	425.
2.000	9.918	4.159	-.27	290.22	1.25	-.59	278.49	7.58	-.94	425.	427.
3.000	4.647	3.278	.75	285.38	1.29	-.23	266.44	9.55	.22	426.	427.
4.000	2.511	2.133	1.20	279.93	1.35	-.17	258.12	9.39	.70	426.	427.
5.000	1.332	1.357	1.88	274.02	1.27	.14	250.24	8.95	1.16	425.	427.
6.000	.706	.790	2.05	268.07	1.25	-.05	243.00	8.57	1.39	425.	427.
7.000	.351	.467	2.76	261.75	1.23	-.38	235.59	7.91	1.87	423.	426.
8.000	.171	.254	3.16	255.19	1.18	-.08	228.48	7.48	2.12	421.	422.
9.000	.087	.131	2.89	248.00	1.18	-.28	221.85	7.76	1.79	420.	421.
10.000	.040	.065	2.66	240.33	1.19	-.30	214.51	8.19	1.63	406.	421.
11.000	.025	.040	1.71	232.40	1.21	-.35	209.25	9.60	1.28	93.	420.
12.000	99.999	99.999	999.99	224.22	1.18	-.55	999.99	99.99	999.99	0.	418.
13.000	99.999	99.999	999.99	216.12	1.29	-.55	999.99	99.99	999.99	0.	417.
14.000	99.999	99.999	999.99	208.20	1.52	-.29	999.99	99.99	999.99	0.	417.
15.000	99.999	99.999	999.99	200.81	1.48	-.10	999.99	99.99	999.99	0.	413.
16.000	99.999	99.999	999.99	194.14	1.61	-.08	999.99	99.99	999.99	0.	410.
17.000	99.999	99.999	999.99	189.72	1.94	.01	999.99	99.99	999.99	0.	390.
18.000	99.999	99.999	999.99	191.37	2.57	.27	999.99	99.99	999.99	0.	385.
19.000	99.999	99.999	999.99	198.41	2.67	-.02	999.99	99.99	999.99	0.	370.
20.000	99.999	99.999	999.99	204.75	2.63	-.12	999.99	99.99	999.99	0.	367.
21.000	99.999	99.999	999.99	209.00	2.44	.01	999.99	99.99	999.99	0.	301.
22.000	99.999	99.999	999.99	212.39	2.39	-.09	999.99	99.99	999.99	0.	298.
23.000	99.999	99.999	999.99	215.59	2.32	.17	999.99	99.99	999.99	0.	297.
24.000	99.999	99.999	999.99	218.06	2.38	.55	999.99	99.99	999.99	0.	337.
25.000	99.999	99.999	999.99	220.26	2.54	.46	999.99	99.99	999.99	0.	341.
26.000	99.999	99.999	999.99	222.30	2.53	.15	999.99	99.99	999.99	0.	339.
27.000	99.999	99.999	999.99	224.47	2.50	.42	999.99	99.99	999.99	0.	262.
28.000	99.999	99.999	999.99	226.39	2.42	.01	999.99	99.99	999.99	0.	222.
29.000	99.999	99.999	999.99	228.36	2.97	.27	999.99	99.99	999.99	0.	191.
30.000	99.999	99.999	999.99	229.78	3.08	.10	999.99	99.99	999.99	0.	186.

TABLE III. 13 MOISTURE RELATED STATISTICAL PARAMETERS, ANNUAL

STATION = 912170 TAGUAC

Z KM	VAPOR P MEAN MB	S.D. VP MB	SKEW VP	TV MEAN DEG K	TV S.D. DEG K	SKEW TV	DEWPT T MEAN DEG K	S.D. DPT DEG K	SKEW DPT	NOBS T+P	NOBS TV
.000	29.401	2.500	-.50	303.05	1.81	-.04	296.85	1.46	-.81	4819.	4819.
.111	28.366	2.385	-.53	302.34	1.72	-.05	296.26	1.43	-.84	4833.	4843.
1.000	19.281	2.830	-.87	295.80	1.34	-.53	289.91	2.55	-1.56	4875.	4893.
2.000	11.272	3.985	-.76	290.19	1.37	-.76	280.67	7.01	-1.49	4891.	4905.
3.000	6.101	3.496	-.04	285.14	1.21	-.21	270.37	9.92	-.52	4888.	4904.
4.000	3.491	2.464	.40	279.51	1.23	.24	262.20	10.43	-.04	4877.	4903.
5.000	2.106	1.770	.72	273.58	1.25	.30	255.14	10.85	.24	4879.	4903.
6.000	1.178	1.154	1.04	267.87	1.23	.04	247.64	10.97	.50	4664.	4695.
7.000	.630	.596	1.32	261.67	1.23	-.05	240.33	10.69	.73	4843.	4879.
8.000	.327	.387	1.43	255.10	1.28	-.07	233.20	10.55	.79	4821.	4849.
9.000	.158	.198	1.49	247.96	1.36	-.07	225.91	10.41	.79	4805.	4837.
10.000	.073	.091	1.36	240.30	1.40	.00	218.60	10.50	.66	4593.	4819.
11.000	.041	.045	.91	232.29	1.43	-.02	213.90	10.74	.31	1179.	4807.
12.000	99.999	99.999	999.99	224.04	1.40	-.17	999.99	99.99	999.99	5.	4790.
13.000	99.999	99.999	999.99	215.85	1.46	-.18	999.99	99.99	999.99	2.	4766.
14.000	99.999	99.999	999.99	207.86	1.62	-.06	999.99	99.99	999.99	2.	4757.
15.000	99.999	99.999	999.99	200.67	1.69	-.01	999.99	99.99	999.99	3.	4707.
16.000	99.999	99.999	999.99	194.93	2.19	.18	999.99	99.99	999.99	0.	4677.
17.000	99.999	99.999	999.99	193.23	3.79	.30	999.99	99.99	999.99	0.	4299.
18.000	99.999	99.999	999.99	195.70	4.69	.14	999.99	99.99	999.99	0.	4215.
19.000	99.999	99.999	999.99	201.17	3.88	-.06	999.99	99.99	999.99	0.	4059.
20.000	99.999	99.999	999.99	206.13	3.01	-.27	999.99	99.99	999.99	0.	4024.
21.000	99.999	99.999	999.99	209.80	2.51	-.33	999.99	99.99	999.99	0.	3061.
22.000	99.999	99.999	999.99	212.77	2.46	-.34	999.99	99.99	999.99	0.	3017.
23.000	99.999	99.999	999.99	215.43	2.30	-.13	999.99	99.99	999.99	0.	2985.
24.000	99.999	99.999	999.99	217.88	2.26	.14	999.99	99.99	999.99	0.	3353.
25.000	99.999	99.999	999.99	220.25	2.33	.16	999.99	99.99	999.99	0.	3643.
26.000	99.999	99.999	999.99	222.52	2.45	.00	999.99	99.99	999.99	0.	3614.
27.000	99.999	99.999	999.99	224.60	2.53	.02	999.99	99.99	999.99	0.	2560.
29.000	99.999	99.999	999.99	226.66	2.63	-.03	999.99	99.99	999.99	0.	2184.
29.000	99.999	99.999	999.99	228.50	2.88	-.14	999.99	99.99	999.99	0.	1857.
30.000	99.999	99.999	999.99	230.08	2.94	-.05	999.99	99.99	999.99	0.	1715.

JANUARY

TABLE IV.1 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1012.5000	1169.0000	301.73
.111	.111	999.9000	1157.0000	301.08
1.000	.997	903.2100	1068.0000	294.64
2.000	1.995	803.7700	967.2000	289.49
3.000	2.991	713.9500	871.8000	285.29
4.000	3.988	632.9100	788.1000	279.76
5.000	4.984	559.7000	711.8000	273.92
6.000	5.980	493.6500	641.7000	268.01
7.000	6.976	434.1900	577.5000	261.92
8.000	7.971	380.7100	519.2000	255.46
9.000	8.966	332.6500	466.8000	248.26
10.000	9.960	289.4800	419.1000	240.64
11.000	10.955	250.7800	375.4000	232.72
12.000	11.949	216.1600	335.3000	224.56
13.000	12.942	185.3200	298.3000	216.45
14.000	13.936	157.9600	263.9000	208.51
15.000	14.929	133.8400	232.0000	201.09
16.000	15.921	112.7300	202.3000	194.12
17.000	16.914	94.4710	173.6000	199.52
18.000	17.906	79.0620	144.1000	191.10
19.000	18.898	66.4250	116.9000	198.02
20.000	19.889	56.1320	95.6900	204.35
21.000	20.881	47.6320	79.7400	208.11
22.000	21.871	40.5340	66.7900	211.40
23.000	22.862	34.5750	56.2200	214.24
24.000	23.852	29.5510	47.5000	216.74
25.000	24.842	25.3000	40.2900	218.74
26.000	25.832	21.6920	34.2400	220.70
27.000	26.821	18.6230	29.1600	222.51
28.000	27.810	16.0090	24.8600	224.32
29.000	28.799	13.7800	21.2300	226.09
30.000	29.787	11.8749	18.1800	227.59

FEBRUARY

TABLE IV. 2 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1013.1000	1170.0000	301.65
.111	.111	1000.5000	1158.0000	300.95
1.000	.997	903.6700	1070.0000	294.26
2.000	1.995	804.0200	969.5000	288.90
3.000	2.991	714.0400	873.0000	284.95
4.000	3.988	632.9500	787.9000	279.85
5.000	4.984	559.7700	711.3000	274.16
6.000	5.980	493.7800	641.2000	268.29
7.000	6.976	434.3100	577.9000	261.83
8.000	7.971	380.7800	519.9000	255.13
9.000	8.966	332.6500	467.3000	247.98
10.000	9.960	289.4300	419.6000	240.28
11.000	10.955	250.6800	375.9000	232.31
12.000	11.949	216.0200	335.7000	224.17
13.000	12.942	185.1500	298.5000	216.09
14.000	13.936	157.7700	264.1000	208.12
15.000	14.929	133.6400	232.1000	200.51
16.000	15.921	112.5300	202.1000	193.97
17.000	16.914	94.3530	172.2000	190.8[illegible]
18.000	17.906	79.0620	143.0000	192.[illegible]
19.000	18.898	66.4690	116.9000	199.0[illegible]
20.000	19.889	56.1440	96.2100	203.[illegible]
21.000	20.881	47.6130	79.8900	207.61
22.000	21.871	40.5030	66.8700	211.02
23.000	22.862	34.5380	56.2800	213.80
24.000	23.852	29.5120	47.5000	216.45
25.000	24.842	25.2630	40.2500	218.64
26.000	25.832	21.6600	34.1800	220.73
27.000	26.821	18.5980	29.0900	222.77
28.000	27.810	15.9930	24.7600	225.05
29.000	28.799	13.7730	21.1300	227.10
30.000	29.787	11.8784	18.0700	229.05

MARCH

TABLE IV. 3 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1012.9000	1168.0000	302.08
.111	.111	1000.3000	1156.0000	301.38
1.000	.997	903.5800	1069.0000	294.48
2.000	1.995	804.0300	968.7000	289.14
3.000	2.991	714.0900	872.9000	284.98
4.000	3.988	632.9300	787.9000	279.83
5.000	4.984	559.8200	711.1000	274.25
6.000	5.980	493.8400	641.1000	268.37
7.000	6.976	434.4100	577.4000	262.09
8.000	7.971	380.9200	519.4000	255.49
9.000	8.966	332.8400	466.9000	248.35
10.000	9.960	289.6700	419.2000	240.74
11.000	10.955	250.9500	375.5000	232.81
12.000	11.949	216.3300	335.5000	224.61
13.000	12.942	185.4600	298.5000	216.48
14.000	13.936	158.0900	264.2000	208.45
15.000	14.929	133.9400	232.3000	200.90
16.000	15.921	112.8000	202.5000	194.08
17.000	16.914	94.5500	173.3000	190.06
18.000	17.906	79.1910	143.4000	192.35
19.000	18.898	66.5800	117.0000	198.32
20.000	19.889	56.2530	96.2300	203.53
21.000	20.881	47.7200	79.9000	208.05
22.000	21.871	40.6060	66.3500	211.29
23.000	22.862	34.6370	56.2700	214.42
24.000	23.852	29.6110	47.5000	217.15
25.000	24.842	25.3610	40.2600	219.46
26.000	25.832	21.7590	34.1600	221.93
27.000	26.821	18.6990	29.0600	224.15
28.000	27.810	16.0940	24.7800	226.27
29.000	28.799	13.8700	21.2000	227.87
30.000	29.787	11.9[illegible]81	18.1400	229.83

APRIL

TABLE IV. 4 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1012.4000	1164.0000	302.96
.111	.111	999.8600	1153.0000	302.22
1.000	.997	903.4200	1066.0000	295.15
2.000	1.995	804.0600	967.3000	289.57
3.000	2.991	714.1300	874.0000	284.65
4.000	3.988	632.9300	789.0000	279.47
5.000	4.984	559.6800	711.8000	273.93
6.000	5.980	493.6600	641.3000	268.14
7.000	6.976	434.1900	577.7000	261.81
8.000	7.971	380.6700	519.8000	255.12
9.000	8.966	332.5600	467.2000	247.99
10.000	9.960	289.3600	419.3000	240.39
11.000	10.955	250.6300	375.7000	232.40
12.000	11.949	216.0000	335.4000	224.37
13.000	12.942	185.1600	298.1000	216.38
14.000	13.936	157.8300	263.7000	208.51
15.000	14.929	133.7400	231.4000	201.31
16.000	15.921	112.7200	201.1000	195.27
17.000	16.914	94.6110	171.7000	191.95
18.000	17.906	79.3300	143.3000	192.86
19.000	18.898	66.7170	117.1000	198.51
20.000	19.889	56.3990	95.9700	204.73
21.000	20.881	47.8300	79.6800	209.38
22.000	21.871	40.7930	66.8100	212.72
23.000	22.862	34.8320	56.2700	215.66
24.000	23.852	29.8050	47.5000	218.51
25.000	24.842	25.5570	40.2300	221.31
26.000	25.832	21.9500	34.1500	223.95
27.000	26.821	18.8970	29.0500	226.65
28.000	27.810	16.2900	24.8400	228.45
29.000	28.799	14.0590	21.2700	230.78
30.000	29.787	12.1502	18.2200	232.33

MAY

TABLE IV. 5 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1011.8000	1161.0000	303.58
.111	.111	999.2900	1149.0000	302.85
1.000	.997	903.1400	1063.0000	296.02
2.000	1.995	804.0600	964.9000	290.30
3.000	2.991	714.7900	873.0000	285.05
4.000	3.988	633.1100	789.8000	279.25
5.000	4.984	559.7600	713.0000	273.51
6.000	5.980	493.6300	642.2000	267.76
7.000	6.976	434.0900	578.3000	261.50
8.000	7.971	380.5300	520.1000	254.90
9.000	8.966	332.4000	467.4000	247.76
10.000	9.960	289.1800	419.6000	240.10
11.000	10.955	250.4300	375.8000	232.18
12.000	11.949	215.7300	335.6000	224.01
13.000	12.942	184.3300	298.3000	215.97
14.000	13.936	157.5300	263.7000	208.22
15.000	14.929	133.5400	230.9000	201.47
16.000	15.921	112.5900	2[illegible] 1000	196.02
17.000	16.914	94.5900	1[illegible]00	193.53
18.000	17.906	79.4610	141.[illegible]00	195.18
19.000	18.898	66.9660	116.1000	200.93
20.000	19.889	56.7190	95.4600	206.98
21.000	20.881	48.2300	79.7200	210.75
22.000	21.871	41.1200	67.0200	213.75
23.000	22.862	35.1380	56.4800	216.74
24.000	23.852	30.0900	47.7500	219.52
25.000	24.842	25.8140	40.5400	221.84
26.000	25.832	22.1040	34.4600	224.29
27.000	26.821	19.0330	29.4000	226.26
28.000	27.810	16.4570	25.0900	228.48
29.000	28.799	14.2050	21.4600	230.57
30.000	29.787	12.2768	18.4300	232.15

JUNE

TABLE IV. 6 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1011.5000	1160.0000	303.86
.111	.111	998.9400	1148.0000	303.12
1.000	.997	902.9400	1061.0000	296.52
2.000	1.995	803.9900	964.1000	290.50
3.000	2.991	714.2600	872.9000	285.05
4.000	3.988	633.0700	789.9300	279.20
5.000	4.984	559.6800	713.6000	273.23
6.000	5.980	493.5000	642.7000	267.49
7.000	6.976	433.9400	578.4000	261.38
8.000	7.971	380.3800	520.0000	254.81
9.000	8.966	332.2400	467.4000	247.63
10.000	9.960	289.0200	419.7000	239.91
11.000	10.955	250.2500	376.0000	231.83
12.000	11.949	215.5800	336.0000	223.53
13.000	12.942	184.6800	298.8000	215.32
14.000	13.936	157.2600	264.2000	207.35
15.000	14.929	133.1800	231.4000	200.53
16.000	15.921	112.2300	199.7000	195.76
17.000	16.914	94.3880	167.8000	196.00
18.000	17.906	79.5230	138.8000	199.58
19.000	18.898	67.2400	114.6000	204.33
20.000	19.889	57.0620	95.3800	208.42
21.000	20.881	48.5640	79.9600	211.59
22.000	21.871	41.4290	67.3100	214.43
23.000	22.862	35.4120	56.8800	216.89
24.000	23.852	30.3240	48.1700	219.32
25.000	24.842	26.0130	40.8700	221.72
26.000	25.832	22.3490	34.7900	223.78
27.000	26.821	19.2290	29.6900	225.70
28.000	27.810	16.5670	25.3300	227.82
29.000	28.799	14.2910	21.7100	229.31
30.000	29.787	12.3401	18.5400	230.61

JULY

TABLE IV. 7 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1010.6000	1160.0000	303.63
.111	.111	998.0500	1148.0000	302.91
1.000	.997	902.1300	1059.0000	296.69
2.000	1.995	803.3200	962.8000	290.65
3.000	2.991	713.7000	872.1000	285.11
4.000	3.988	632.5600	789.6000	279.07
5.000	4.984	559.2000	713.3000	273.11
6.000	5.980	493.0500	642.4000	267.39
7.000	6.976	433.5300	578.0000	261.32
8.000	7.971	380.0100	519.6000	254.80
9.000	8.966	331.9300	466.9000	247.68
10.000	9.960	288.7500	419.1000	239.99
11.000	10.955	250.0300	375.7000	231.83
12.000	11.949	215.3800	335.8000	223.41
13.000	12.942	184.4800	298.8000	215.07
14.000	13.936	157.0700	264.4000	206.95
15.000	14.929	132.9400	231.8000	199.79
15.000	15.921	111.9600	199.9000	195.11
17.000	16.914	94.2130	165.9000	197.85
18.000	17.906	79.5110	137.3000	201.69
19.000	18.898	67.3230	114.1000	205.57
20.000	19.889	57.1720	95.3300	208.93
21.000	20.881	48.6710	80.0600	211.78
22.000	21.871	41.5180	67.5400	214.15
23.000	22.862	35.4790	57.1000	216.45
24.000	23.852	30.3720	48.3500	218.83
25.000	24.842	26.0410	41.0700	220.88
26.000	25.832	22.3610	34.9500	222.90
27.000	26.821	19.2270	29.8100	224.72
28.000	27.810	16.5540	25.4300	226.79
29.000	28.799	14.2710	21.7800	228.24
30.000	29.707	12.3143	19.[illegible]0	229.51

AUGUST

TABLE IV. 8 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1010.3000	1160.0000	303.37
.111	.111	997.7500	1148.0000	302.66
1.000	.997	901.8200	1059.0000	296.72
2.000	1.995	803.0700	962.3000	290.74
3.000	2.991	713.4900	871.8000	285.11
4.000	3.988	632.3900	789.1000	279.17
5.000	4.984	559.0800	712.7000	273.28
6.000	5.980	492.9900	641.8000	267.57
7.000	6.976	433.5200	577.4000	261.57
8.000	7.971	380.0600	519.0000	255.10
9.000	8.966	332.0200	466.4000	247.98
10.000	9.960	288.8800	418.8000	240.30
11.000	10.955	250.1900	375.4000	232.14
12.000	11.949	215.5500	335.7000	223.67
13.000	12.942	184.6600	299.9000	215.22
14.000	13.936	157.2300	264.7000	206.94
15.000	14.929	133.0700	232.1000	199.69
16.000	15.921	112.0700	200.0000	195.22
17.000	16.914	94.3150	166.0000	197.94
18.000	17.906	79.6040	137.4000	201.82
19.000	18.898	67.4080	114.2000	205.67
20.000	19.889	57.2410	95.5400	208.72
21.000	20.881	48.7230	80.2100	211.62
22.000	21.871	41.5560	67.6500	213.97
23.000	22.862	35.5030	57.2300	215.89
24.000	23.852	30.3740	48.6000	217.74
25.000	24.842	26.0230	41.2600	219.70
26.000	25.832	22.3290	35.0000	221.88
27.000	26.821	19.1860	29.6600	223.80
28.000	27.810	16.5080	25.4800	225.70
29.000	28.799	14.2210	21.8000	227.26
30.000	29.787	12.2634	18.6300	228.53

SEPTEMBER

TABLE IV. 9 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1010.5000	1160.0000	303.54
.111	.111	997.9300	1148.0000	302.84
1.000	.997	902.0400	1058.0000	296.89
2.000	1.995	803.3300	961.8000	290.96
3.000	2.991	713.7800	871.5000	285.33
4.000	3.988	632.6900	789.2000	279.29
5.000	4.984	559.3600	713.2000	273.24
6.000	5.980	493.2200	642.4000	267.45
7.000	6.976	433.6900	578.0000	261.39
8.000	7.971	380.1600	519.6000	254.87
9.000	8.966	332.0700	466.9000	247.76
10.000	9.960	288.8900	419.1000	240.14
11.000	10.955	250.1800	375.7000	232.01
12.000	11.949	215.5300	335.9000	223.56
13.000	12.942	184.6300	298.9000	215.18
14.000	13.936	157.2100	264.5000	207.06
15.000	14.929	133.0700	231.8000	200.00
16.000	15.921	112.0900	199.9000	195.36
17.000	16.914	94.2810	167.2000	196.47
18.000	17.906	79.4740	138.2000	200.30
19.000	18.898	67.2210	114.6000	204.38
20.000	19.889	57.0320	95.6300	207.76
21.000	20.881	48.5140	80.1400	210.90
22.000	21.871	41.3540	67.6000	213.12
23.000	22.862	35.3090	57.1700	215.16
24.000	23.652	30.1950	48.4300	217.22
25.000	24.842	25.6630	41.0200	219.63
26.000	25.832	22.1900	34.8600	221.74
27.000	26.821	19.0670	29.6600	223.95
28.000	27.810	16.4090	25.2900	226.07
29.000	28.799	14.1420	21.5700	228.38
30.000	29.787	12.2050	18.4900	229.59

OCTOBER

TABLE IV. 10 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1010.4000	1159.0000	303.61
.111	.111	997.9100	1148.0000	302.90
1.000	.997	902.0300	1059.0000	296.85
2.000	1.995	803.2900	962.1000	290.87
3.000	2.991	713.7400	871.4000	285.34
4.000	3.988	632.6900	788.6000	279.49
5.000	4.984	559.4200	712.4000	273.57
6.000	5.980	493.3500	641.6000	267.86
7.000	6.976	433.8800	577.6000	261.67
8.000	7.971	380.3800	519.5000	255.08
9.000	8.966	332.2900	466.9000	247.93
10.000	9.960	289.1100	419.3000	240.21
11.000	10.955	250.3800	375.7000	232.19
12.000	11.949	215.7400	335.7000	223.87
13.000	12.942	184.8600	298.6000	215.63
14.000	13.936	157.4700	264.2000	207.62
15.000	14.929	133.3600	231.4000	200.76
16.000	15.921	112.3700	200.5000	195.22
17.000	16.914	94.3810	169.9000	193.51
18.000	17.906	79.3340	140.4000	196.81
19.000	18.898	66.9490	115.2000	202.42
20.000	19.889	56.7280	95.6900	206.53
21.000	20.881	48.2190	79.9300	210.19
22.000	21.871	41.0930	67.1600	213.15
23.000	22.862	35.0870	56.6000	215.18
24.000	23.652	30.0080	48.0600	217.53
25.000	24.842	25.7100	40.7000	220.07
26.000	25.832	22.0700	34.5100	222.80
27.000	26.821	18.9780	29.3700	225.12
28.000	27.810	16.3440	25.0700	227.13
29.000	28.799	14.0950	21.4200	229.21
30.000	29.787	12.1731	18.3300	231.29

NOVEMBER

TABLE IV. 11 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1010.4000	1160.0000	303.57
.111	.111	997.8700	1148.0000	302.88
1.000	.997	901.9400	1059.0000	296.56
2.000	1.995	803.1700	962.0000	290.85
3.000	2.991	713.6500	870.9000	285.47
4.000	3.988	632.6600	787.7000	279.80
5.000	4.984	559.4900	711.4000	273.97
6.000	5.980	493.4800	641.3000	268.06
7.000	6.976	434.0300	577.4000	261.83
8.000	7.971	380.5600	519.3000	255.29
9.000	8.966	332.4900	466.7000	248.19
10.000	9.960	289.3300	418.9000	240.61
11.000	10.955	250.6500	375.3000	232.66
12.000	11.949	216.0500	335.2000	224.53
13.000	12.942	185.2200	298.1000	216.45
14.000	13.936	157.8800	263.8000	208.51
15.000	14.929	133.7800	231.6000	201.22
16.000	15.921	112.7200	201.6000	194.79
17.000	16.914	94.5630	172.2000	191.36
18.000	17.906	79.2830	143.0000	193.13
19.000	18.898	66.7130	116.5000	199.46
20.000	19.889	56.4340	95.7200	205.38
21.000	20.881	47.9310	79.7700	209.31
22.000	21.871	40.8200	66.9600	212.31
23.000	22.862	34.8430	56.4000	215.21
24.000	23.652	29.8040	47.6500	217.87
25.000	24.842	25.5420	40.3600	220.49
26.000	25.832	21.9310	34.2500	223.08
27.000	26.821	18.8610	29.1800	225.16
28.000	27.810	16.2450	24.8900	227.35
29.000	28.793	14.0110	21.2700	229.45
30.000	29.787	12.0997	18.2680	230.83

DECEMBER

TABLE IV. 12 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1012.0000	1164.0000	302.85
.111	.111	999.4300	1152.0000	302.18
1.000	.997	903.1000	1064.0000	295.65
2.000	1.995	803.9600	965.0000	290.22
3.000	2.991	714.2400	871.9000	285.38
4.000	3.988	633.2000	788.0000	279.93
5.000	4.984	559.9800	711.9000	274.02
6.000	5.980	493.9200	641.9000	268.07
7.000	6.976	434.4100	578.2000	261.75
8.000	7.971	380.8600	519.9000	255.19
9.000	8.966	332.7300	467.4000	248.00
10.000	9.960	289.5100	419.7000	240.33
11.000	10.955	250.7500	375.9000	232.40
12.000	11.949	216.1000	335.7000	224.22
13.000	12.942	185.2200	298.6000	216.12
14.000	13.936	157.8400	264.1000	208.20
15.000	14.929	133.7100	232.0000	200.81
16.000	15.921	112.6100	202.1000	194.14
17.000	16.914	94.3770	173.3000	189.72
18.000	17.906	78.9980	143.8000	191.37
19.000	18.898	66.3910	116.6000	198.41
20.000	19.889	56.1220	95.4900	204.75
21.000	20.881	47.6480	79.4200	209.00
22.000	21.871	40.5760	66.5500	212.79
23.000	22.862	34.6410	55.9700	215.59
24.000	23.652	29.6370	47.3500	218.06
25.000	24.842	25.3990	40.1700	220.26
26.000	25.832	21.8000	34.1600	222.30
27.000	26.821	18.7390	29.0800	224.47
28.000	27.810	16.1310	24.8200	226.39
29.000	28.799	13.9040	21.2100	228.36
30.000	29.787	11.9991	18.1900	229.75

ANNUAL

TABLE IV. 13 HYDROSTATIC MODEL ATMOSPHERE.
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1011.5000	1163.0000	303.05
.111	.111	998.9600	1151.0000	302.34
1.000	.997	902.7400	1063.0000	295.88
2.000	1.995	803.6700	964.8000	290.19
3.000	2.991	713.9400	872.2000	285.14
4.000	3.988	632.8400	788.7000	279.51
5.000	4.984	559.5800	712.3000	273.09
6.000	5.980	493.5000	641.8000	267.87
7.000	6.976	434.0100	577.8000	261.67
8.000	7.971	380.5000	519.6000	255.10
9.000	8.966	332.4000	467.0000	247.95
10.000	9.960	289.2100	419.3000	240.30
11.000	10.955	250.4900	375.7000	232.29
12.000	11.949	215.8500	335.6000	224.04
13.000	12.942	184.9800	298.5000	215.85
14.000	13.935	157.6000	264.1000	207.86
15.000	14.929	133.4800	231.7000	200.67
16.000	15.921	112.4500	201.0000	194.93
17.000	16.914	94.4240	170.2000	193.23
18.000	17.906	79.3210	141.2000	195.70
19.000	18.898	66.6700	115.8000	201.17
20.000	19.889	56.6230	95.7000	206.13
21.000	20.881	48.1150	79.9000	209.80
22.000	21.871	40.9920	67.1200	212.77
23.000	22.862	34.9990	56.6000	215.43
24.000	23.852	29.9390	47.8700	217.88
25.000	24.842	25.6560	40.5800	220.25
26.000	25.832	22.0230	34.4800	222.52
27.000	26.821	18.9330	29.3700	224.60
28.000	27.810	16.3000	25.0500	226.66
29.000	28.799	14.0510	21.4200	228.50
30.000	29.787	12.1277	18.3600	230.08

ANNUAL

TABLE IV. 13 HYDROSTATIC MODEL ATMOSPHERE,
STATION = 912170 TAGUAC

Z KM	GEO. HT. KM	P MB	D G/M3	TV DEG K
.000	.000	1011.5000	1163.0000	303.05
.111	.111	998.9600	1151.0000	302.34
1.000	.997	902.7400	1063.0000	295.88
2.000	1.995	803.6700	964.8000	290.19
3.000	2.991	713.9400	872.2000	285.14
4.000	3.988	632.8400	788.7000	279.51
5.000	4.984	559.5800	712.3000	273.69
6.000	5.980	493.5000	641.8000	267.87
7.000	6.976	434.0100	577.8000	261.67
8.000	7.971	380.5000	519.6000	255.10
9.000	8.966	332.4000	467.0000	247.95
10.000	9.960	289.2100	419.3000	240.30
11.000	10.955	250.4900	375.7000	232.29
12.000	11.949	215.8500	335.6000	224.04
13.000	12.942	184.9900	298.5000	215.85
14.000	13.935	157.6000	264.1000	207.56
15.000	14.929	133.4800	231.7000	200.67
16.000	15.921	112.4500	201.0000	194.93
17.000	16.914	94.4240	170.2000	193.23
18.000	17.906	79.3210	141.2000	195.70
19.000	18.898	66.6700	115.8000	201.17
20.000	19.889	56.6230	95.7000	206.13
21.000	20.881	48.1150	79.9000	209.80
22.000	21.871	40.9920	67.1200	212.77
23.000	22.862	34.9990	56.6000	215.43
24.000	23.852	29.9390	47.8700	217.88
25.000	24.842	25.6560	40.5800	220.25
26.000	25.832	22.0230	34.4800	222.52
27.000	26.821	18.9330	29.3700	224.60
28.000	27.810	16.3000	25.0500	226.66
29.000	28.799	14.0510	21.4200	228.50
30.000	29.787	12.1277	18.3600	230.08

APPENDIX A

EXAMPLES OF WIND STATISTICS FOR EGLIN AFB, FLORIDA

Appendix A gives some examples of further computations and graphical displays of wind statistics that can be derived from the statistical parameters presented in table I. These illustrations should aid the user of the RRA to understand the functional relationships of the probability wind models and, thus, to develop an appreciation of the powerful properties of the bivariate normal probability distribution function (PDF).

All illustrations for this appendix are derived from the five wind component statistical parameters from table I.1 for January and table I.7 for July for nine selected altitudes. These selected altitudes are 2, 4, 8, 12, 16, 20, 24, 28, and 30 km.

1. Windspeed (Tables A-1 and A-2)

The five wind components from table I are used as inputs to the generalized Rayleigh PDF, equation (29), and numerically integrated as indicated by equation (30) to obtain the PDF for windspeed. The PDF is then interpolated to obtain the percentile values for windspeed, as shown in tables A-1 and A-2.

2. Frequency of Wind Direction (Figures A-1 through A-18)

The derived frequencies for wind direction shown in figures A-1 through A-18 were obtained using the five wind component parameters from tables I.1 and I.7 as input values in equation (35). The limits of integration (performed numerically) are over the 22.5-degree interval for each of the 16 compass points. These graphs give the percentage frequency that the wind will blow from the direction intervals.

3. Mean Wind Components and 80th Interpercentile Range of Wind Components (Figures A-19 through A-36)

The wind component means with respect to any orthogonal axes are obtained by using the zonal and meridional mean wind components in equations (44) and (45). These component means form the circle shown in figures A-19 through A-36. Further, the zonal and meridional wind component variances and correlation coefficients are used in equations (46) and (47) to obtain the variances with respect to any orthogonal axes. These rotated component variances and the rotated component means are used in equation (8) to obtain the 80th interpercentile range of wind components and are then illustrated in figures A-19 through A-36.

4. Probability Ellipses (Figures A-37 through A-54)

Using the five wind component parameters from tables I.1 and I.7 and $p = 0.50$, $p = 0.95$, and $p = 0.99$ as input values to equation (13), the wind

probability ellipses shown in figures A-37 through A-54 were obtained by computer graphics. The statistical inferences are, for example, that 50 percent of the wind vectors lie within the smaller ellipse and 99 percent of the wind vectors lie within the outer ellipse. These probability ellipses are illustrated using the standard meteorological coordinate system explained in section I.B.1.

5. Conditional Windspeed Given the Wind Direction (Figures A-55 through A-72)

The five wind component parameters from table I.1 and table I.7 are used to evaluate the conditional PDF, equation (41). Interpolations of the conditional function are made to obtain the 5th, 15th, 50th (median), 85th, 95th, and 99th conditional percentile values of windspeed given the wind directions are as shown in figures A-55 through A-72. The conditional mean windspeed, given the wind direction, is obtained from equation (40). The conditional mode (most probable) windspeed, given the wind direction, is obtained from equation (38). The conditional mean windspeed and the conditional windspeed modal value, given the wind direction, are also shown in these figures. For some figures, the conditional windspeed values are invalid for the given wind direction near 270° (from the west). This is caused by the lack of computational precision in evaluating equations (40) and (41) when the arguments for the Gaussian probability distribution have large negative values, i.e., when the coefficients (b/a) become less than -4 in these equations.

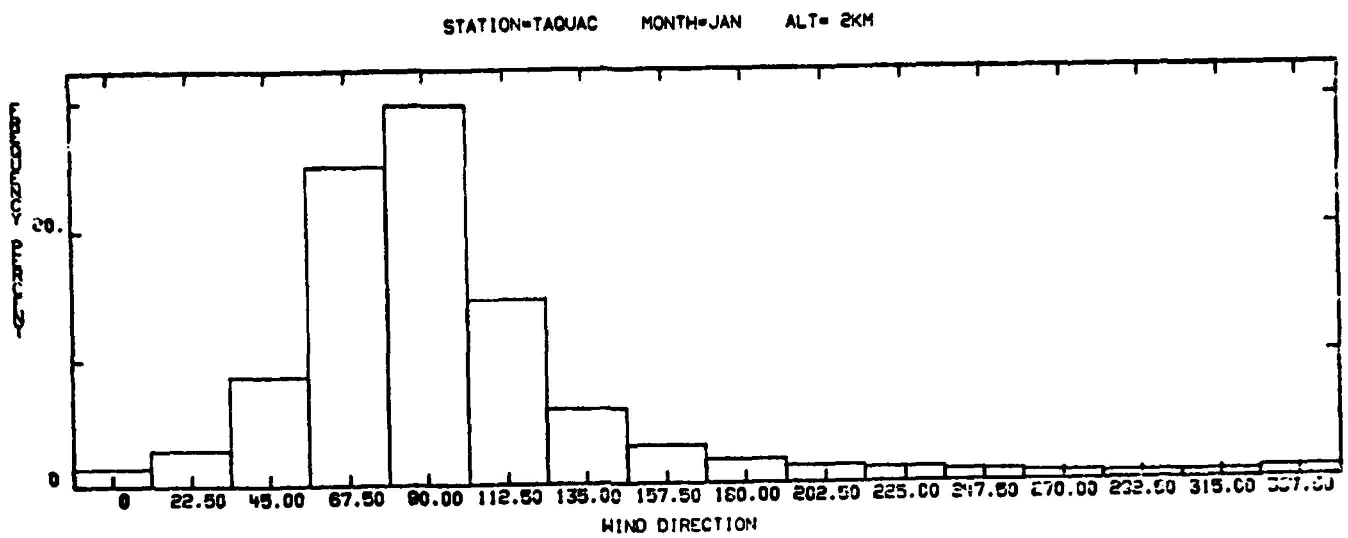
This appendix contains only a few of the many options in presenting wind statistics illustrations.

TABLE A-1. DERIVED (RAYLEIGH) PERCENTILES FOR WINDSPEED, JANUARY, TAQUAC, GUAM ISLAND

	Altitude (km)								
	2	4	8	12	16	20	24	28	30
P	R	R	R	R	R	R	R	R	R
%	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S
1.0	1.00	.75	.43	.66	1.39	.30	.56	1.00	1.06
2.5	1.51	1.30	1.03	1.22	2.27	.75	1.14	1.52	1.67
5.0	2.23	1.94	1.42	1.79	3.22	1.19	1.65	2.25	2.44
10.0	3.22	2.79	2.13	2.59	4.53	1.76	2.46	3.30	3.59
15.0	4.03	3.48	2.66	3.25	5.54	2.25	3.15	4.18	4.55
20.0	4.72	4.11	3.16	3.81	6.40	2.68	3.78	4.98	5.44
30.0	5.99	5.23	4.06	4.83	7.90	3.53	5.04	6.54	7.16
40.0	7.17	6.31	4.95	5.78	9.24	4.40	6.40	8.17	8.98
50.0	8.35	7.40	5.89	6.74	10.57	5.34	7.91	9.99	11.01
60.0	9.58	8.57	6.94	7.74	11.95	6.42	9.65	12.10	13.38
70.0	10.92	9.88	8.19	8.87	13.50	7.69	11.71	14.63	16.20
80.0	12.55	11.50	9.79	10.25	15.38	9.29	14.30	17.87	19.82
85.0	13.55	12.52	10.84	11.12	16.58	10.31	15.95	19.97	22.17
90.0	14.82	13.82	12.20	12.25	18.11	11.62	18.11	22.74	25.23
95.0	16.72	15.78	14.30	13.94	20.47	13.60	21.40	26.97	29.80
97.5	18.39	17.52	16.15	15.48	22.56	15.34	24.30	30.79	34.19
99.0	20.32	19.54	18.36	17.26	24.99	17.38	27.71	35.32	39.23

TABLE A-2. DERIVED (RAYLEIGH) PERCENTILES FOR WINDSPEED, JULY, TAQUAC, GUAM ISLAND

	Altitude (km)								
	2	4	8	12	16	20	24	28	30
P	R	R	R	R	R	R	R	R	R
%	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S	M/S
1.0	.46	.51	.44	1.10	1.39	8.11	6.06	11.28	13.52
2.5	1.05	1.09	1.04	1.75	2.29	9.47	8.49	13.92	16.17
5.0	1.45	1.54	1.42	2.52	3.26	10.70	10.67	16.18	18.42
10.0	2.17	2.28	2.13	3.65	4.62	12.11	13.22	18.81	21.06
15.0	2.70	2.86	2.64	4.54	5.67	13.06	14.96	20.58	22.83
20.0	3.19	3.36	3.12	5.33	6.57	13.80	16.33	22.01	24.24
30.0	4.06	4.28	3.96	6.75	8.16	15.04	18.57	24.31	26.53
40.0	4.88	5.15	4.76	8.09	9.60	16.08	20.50	26.29	28.50
50.0	5.72	6.02	5.57	9.43	11.02	17.06	22.30	28.14	30.34
60.0	6.62	6.96	6.43	10.84	12.49	18.03	24.10	29.98	32.18
70.0	7.64	8.02	7.40	12.45	14.10	19.08	26.03	31.96	34.15
80.0	8.89	9.36	8.60	14.41	16.04	20.33	28.29	34.28	36.46
85.0	9.71	10.20	9.36	15.66	17.27	21.06	29.68	35.71	37.87
90.0	10.75	11.29	10.35	17.27	18.80	22.00	31.43	37.51	39.66
95.0	12.34	12.93	11.84	19.74	21.10	23.46	34.00	40.15	42.30
97.5	13.74	14.43	13.17	21.94	23.12	24.68	36.27	42.47	44.60
99.0	15.40	16.12	14.77	24.62	25.51	26.06	38.85	45.13	47.26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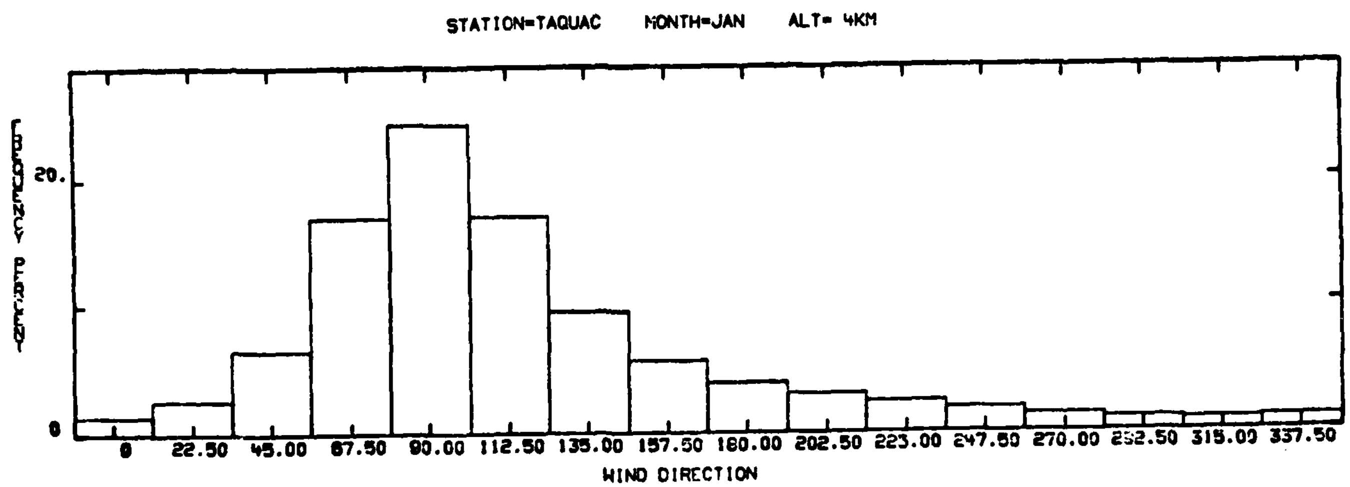
FREQUENCY PERCENT
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
270.00
315.00
WIND DIRECTION

Fig. A-1.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FREQUENCY PERCENT
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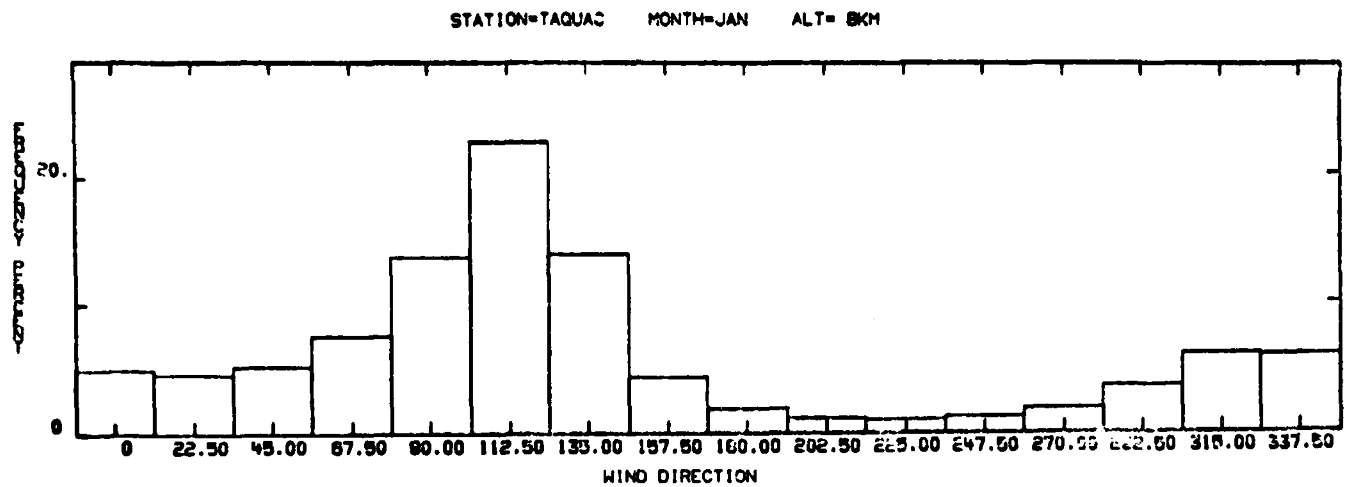
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
315.00
337.50
WIND DIRECTION

Fig. A-2.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20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-3.

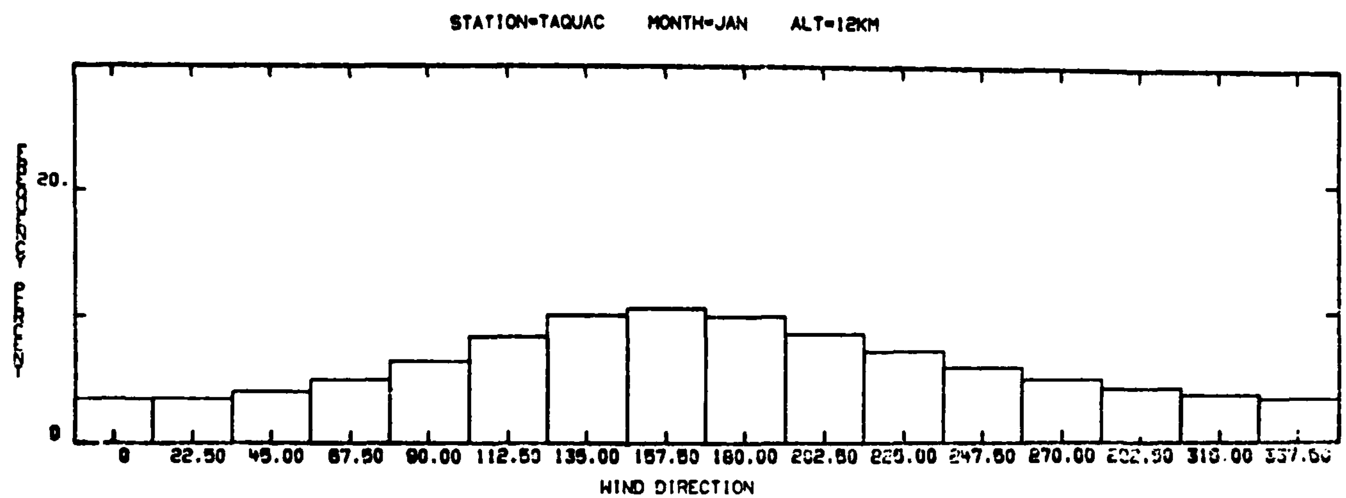
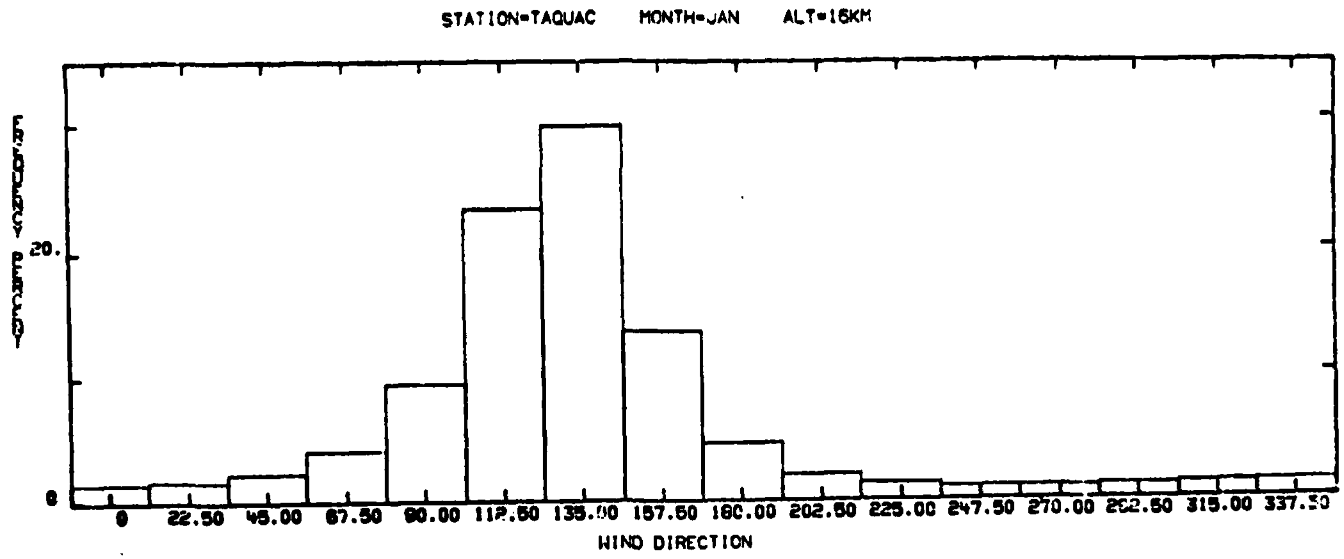

STATION=TAQUAC MONTH=JAN ALT=12KM
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-4.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FREQUENCY PERCENT
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0
22.50
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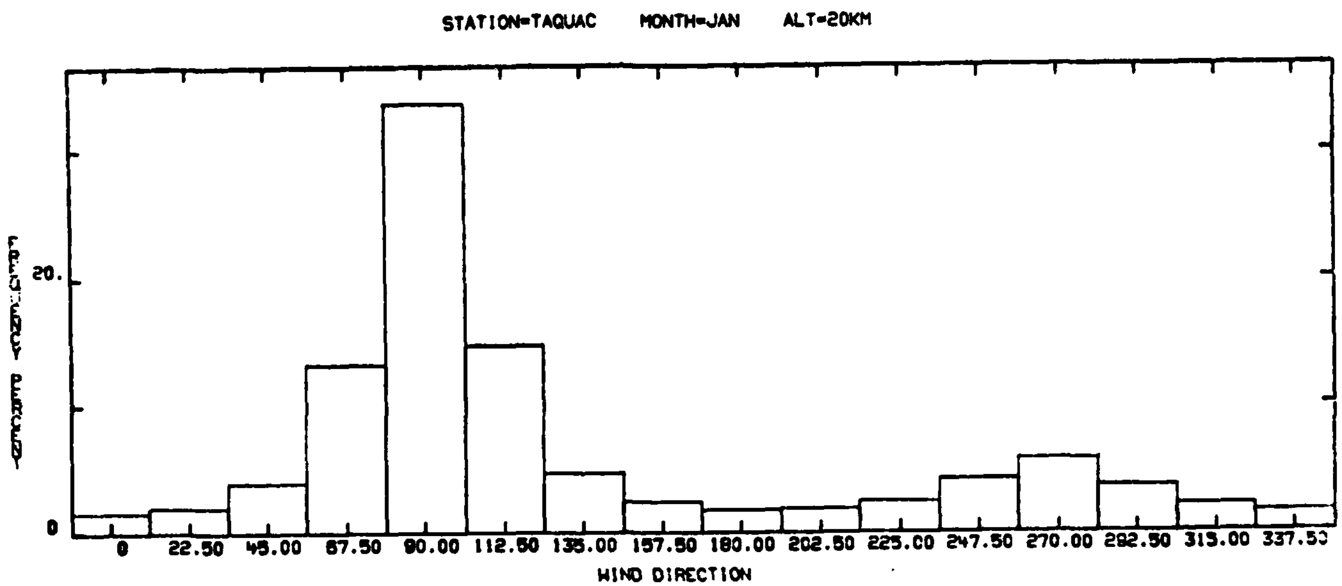
67.50
90.00
135.00
157.50
180.00
202.50
225.00
247.50
270.00
315.00
337.50
WIND DIRECTION

Fig. A-5.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FREQUENCY PERCENT
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
WIND DIRECTION

Fig. A-6.

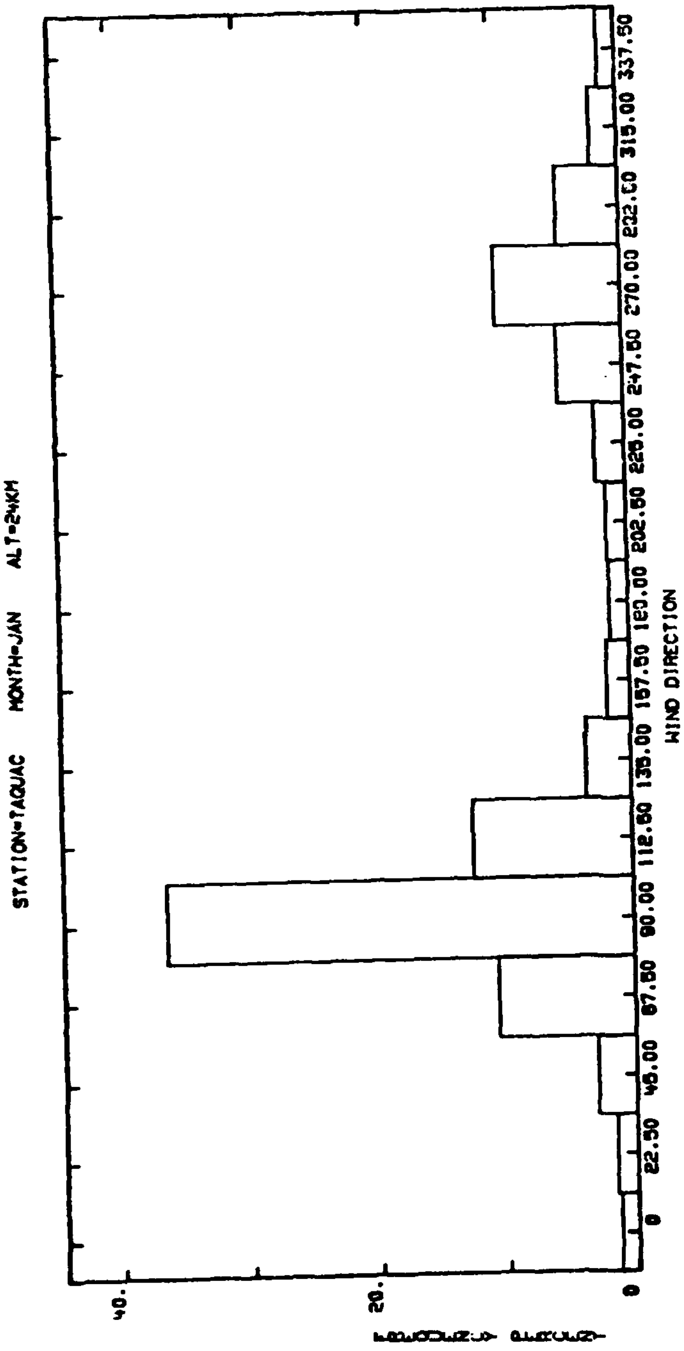

STATION=TAQUAC MONTH=JAN ALT=24KM
WIND DIRECTION
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
0
20.
40.

Fig. A-7.

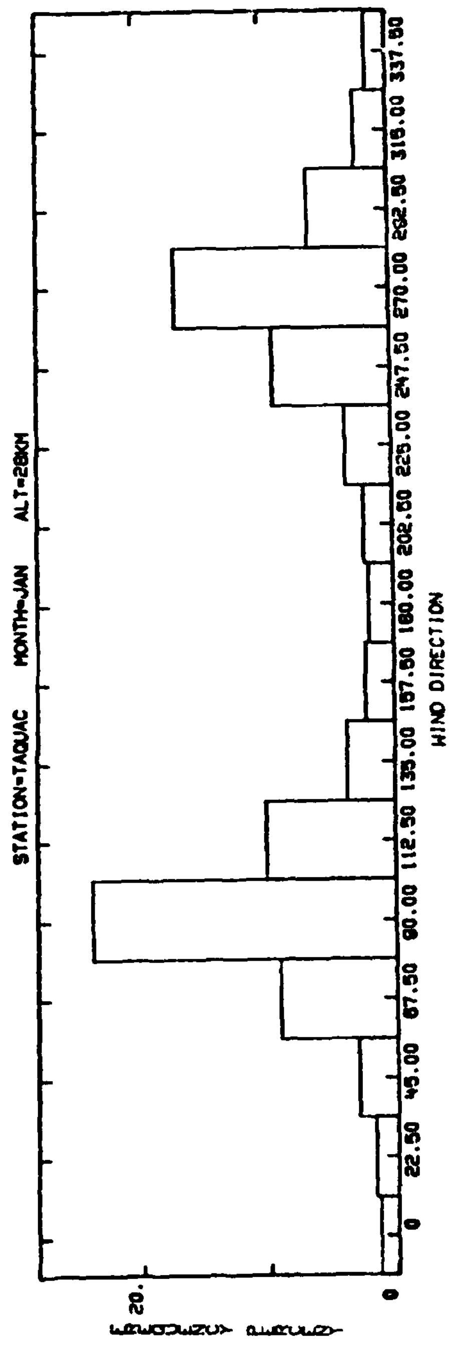

STATION=TAQUAC MONTH=JAN ALT=28KM
WIND DIRECTION
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
0
20.

Fig. A-8.

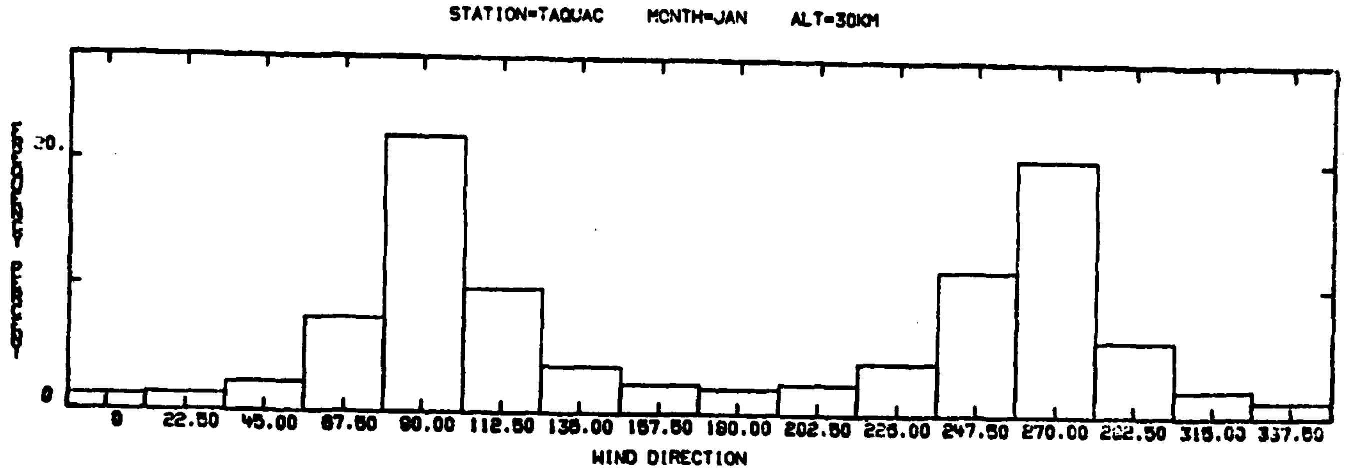


Fig. A-9.

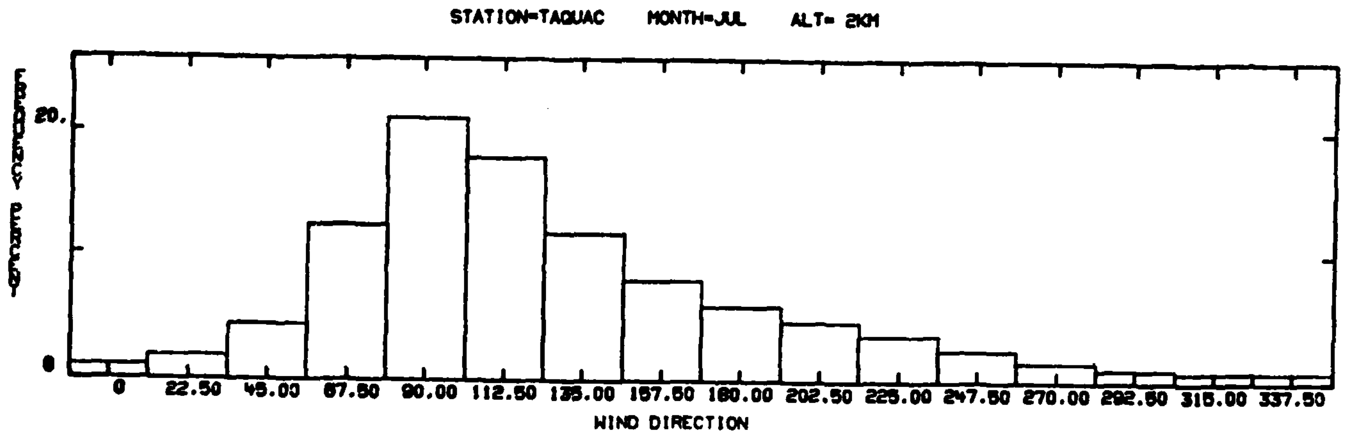


Fig. A-10.

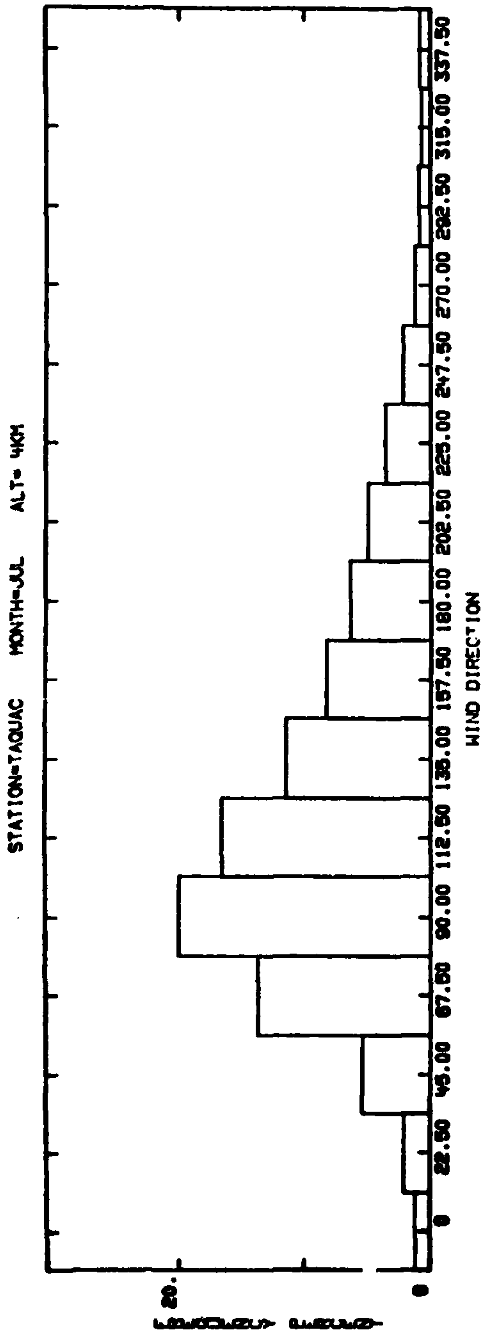


Fig. A-11.

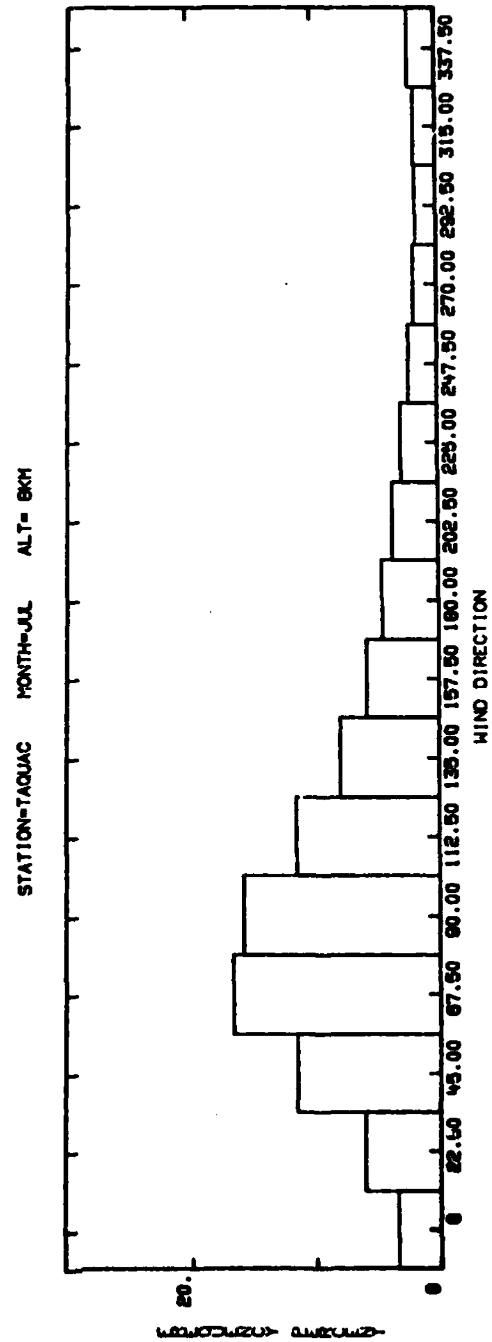


Fig. A-12.

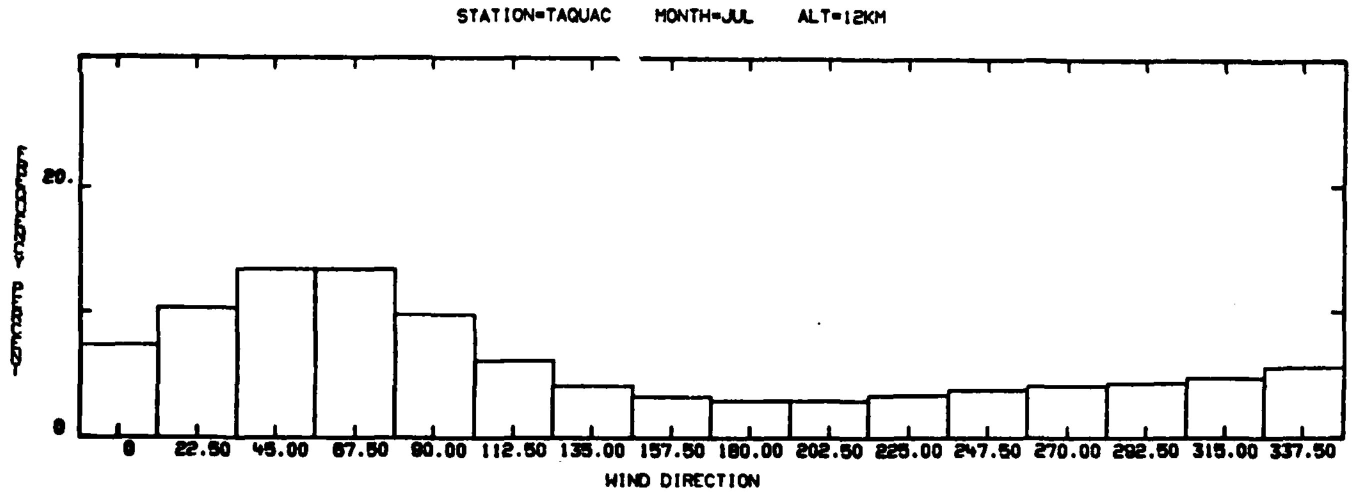


Fig. A-13.

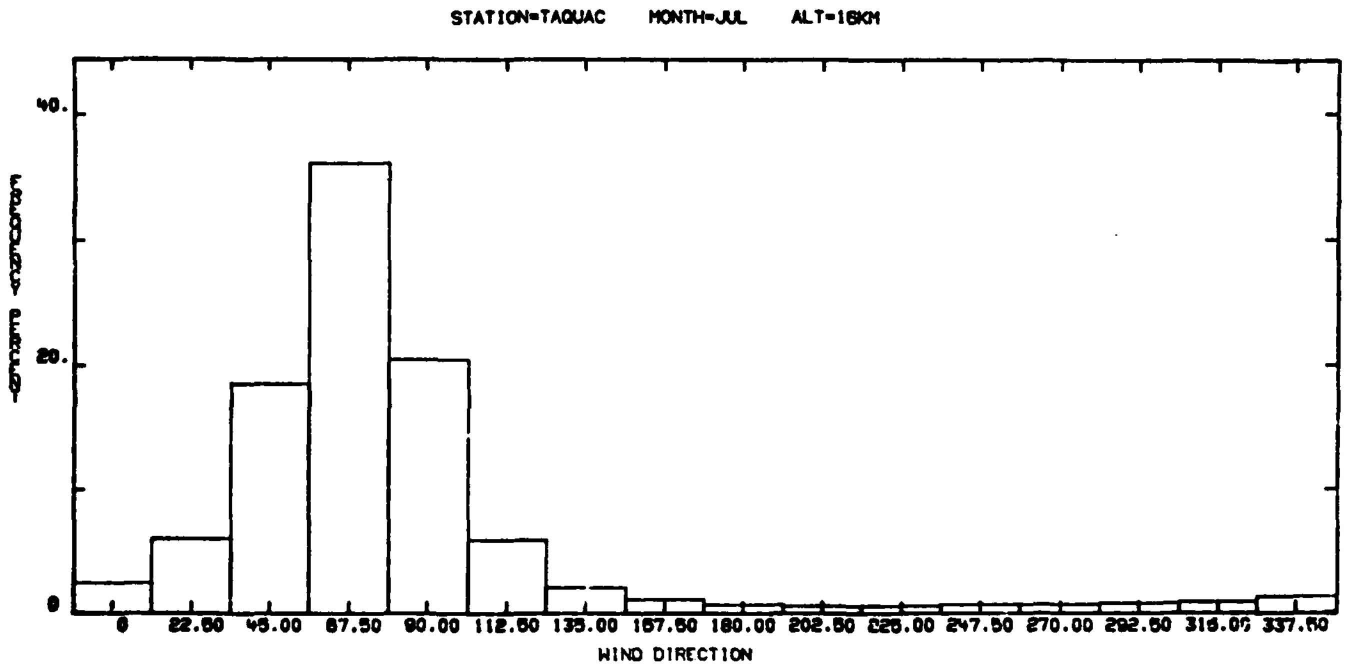
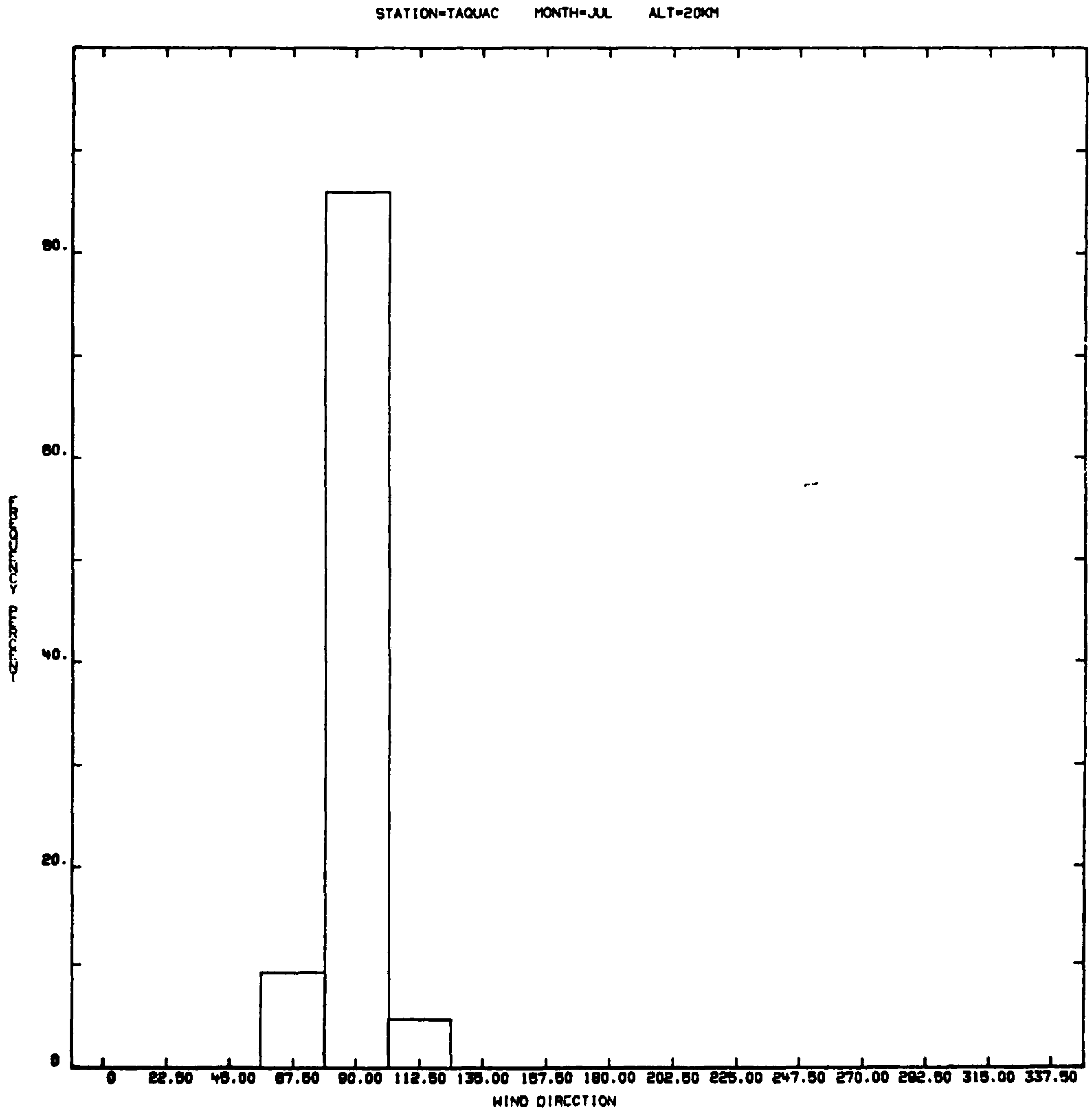


Fig. A-14.



STATION=TAQUAC MONTH=JUL ALT=20KM
80.
60.
40.
20.
0
FREQUENCY PERCENT
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-15.

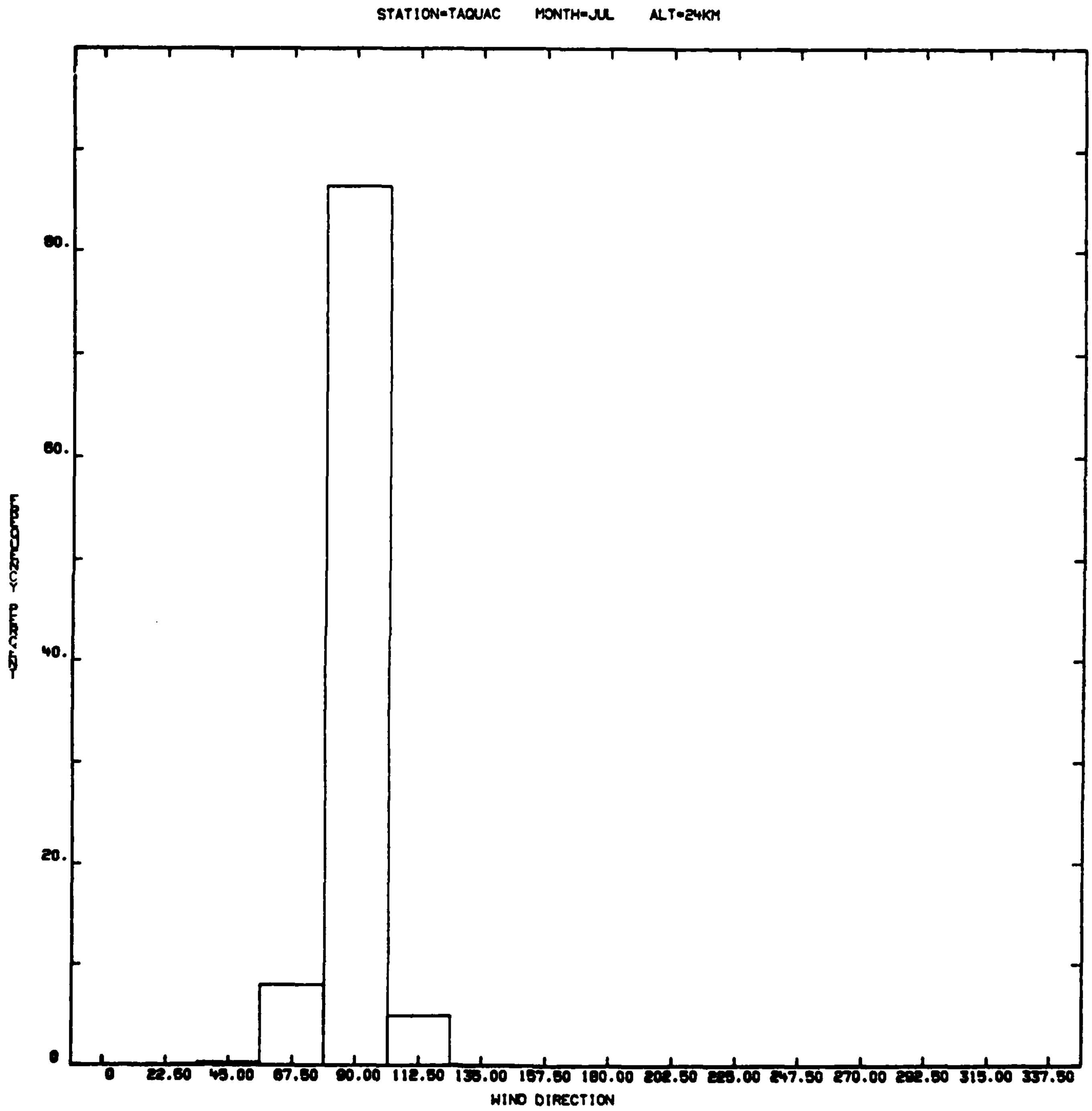

STATION=TAQUAC MONTH=JUL ALT=24KM
FREQUENCY PERCENT
80.
60.
40.
20.
0
0 22.50 45.00 67.50 90.00 112.50 135.00 157.50 180.00 202.50 225.00 247.50 270.00 292.50 315.00 337.50
WIND DIRECTION

Fig. A-16.

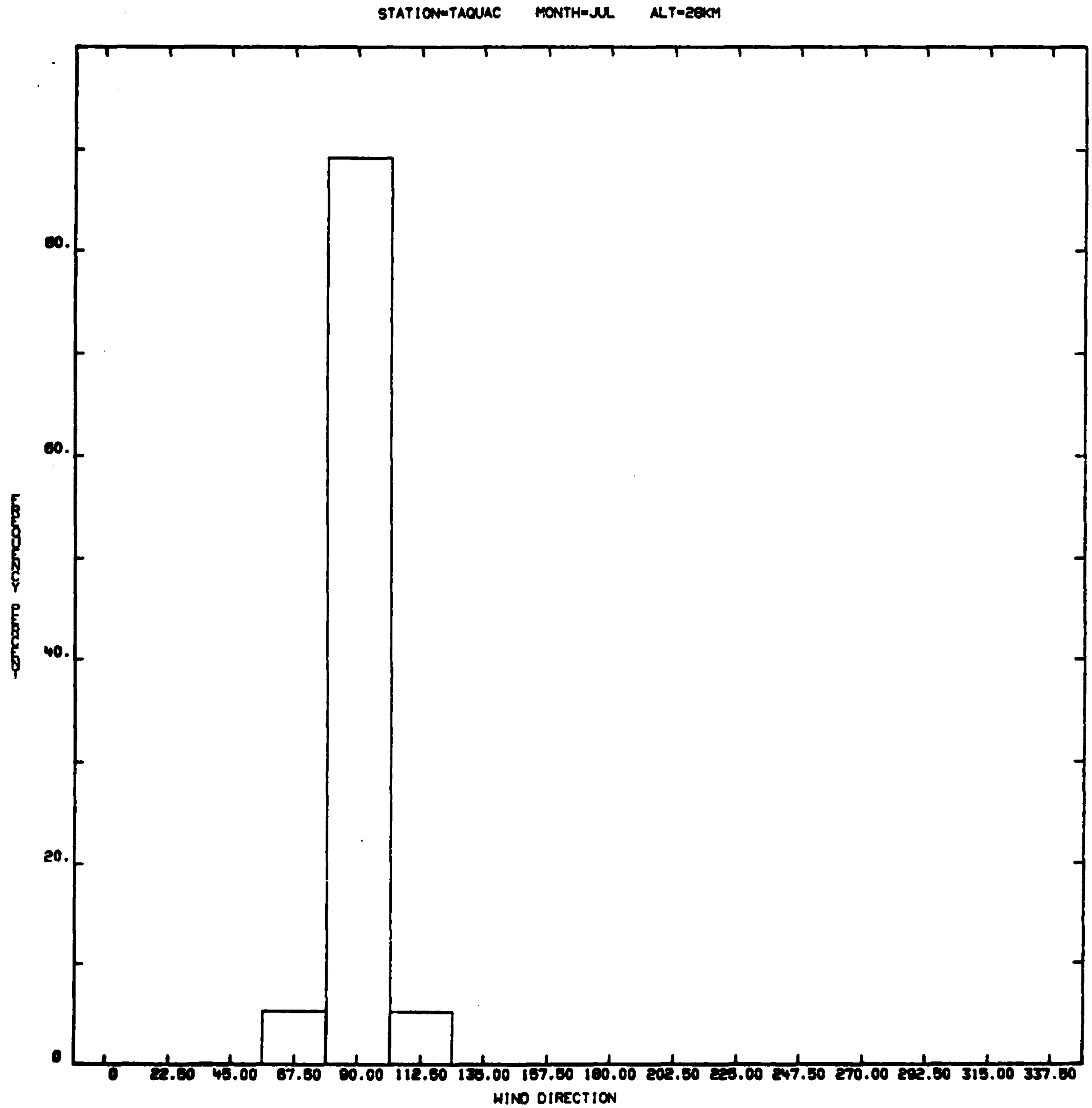

STATION=TAQUAC MONTH=JUL ALT=28KM
80.
60.
40.
20.
0
0
22.50
45.00
67.50
90.00
112.50
135.00
157.50
180.00
202.50
225.00
247.50
270.00
292.50
315.00
337.50
WIND DIRECTION

Fig. A-17.

STATION=TAQUAC   MONTH=JUL   ALT=30KM

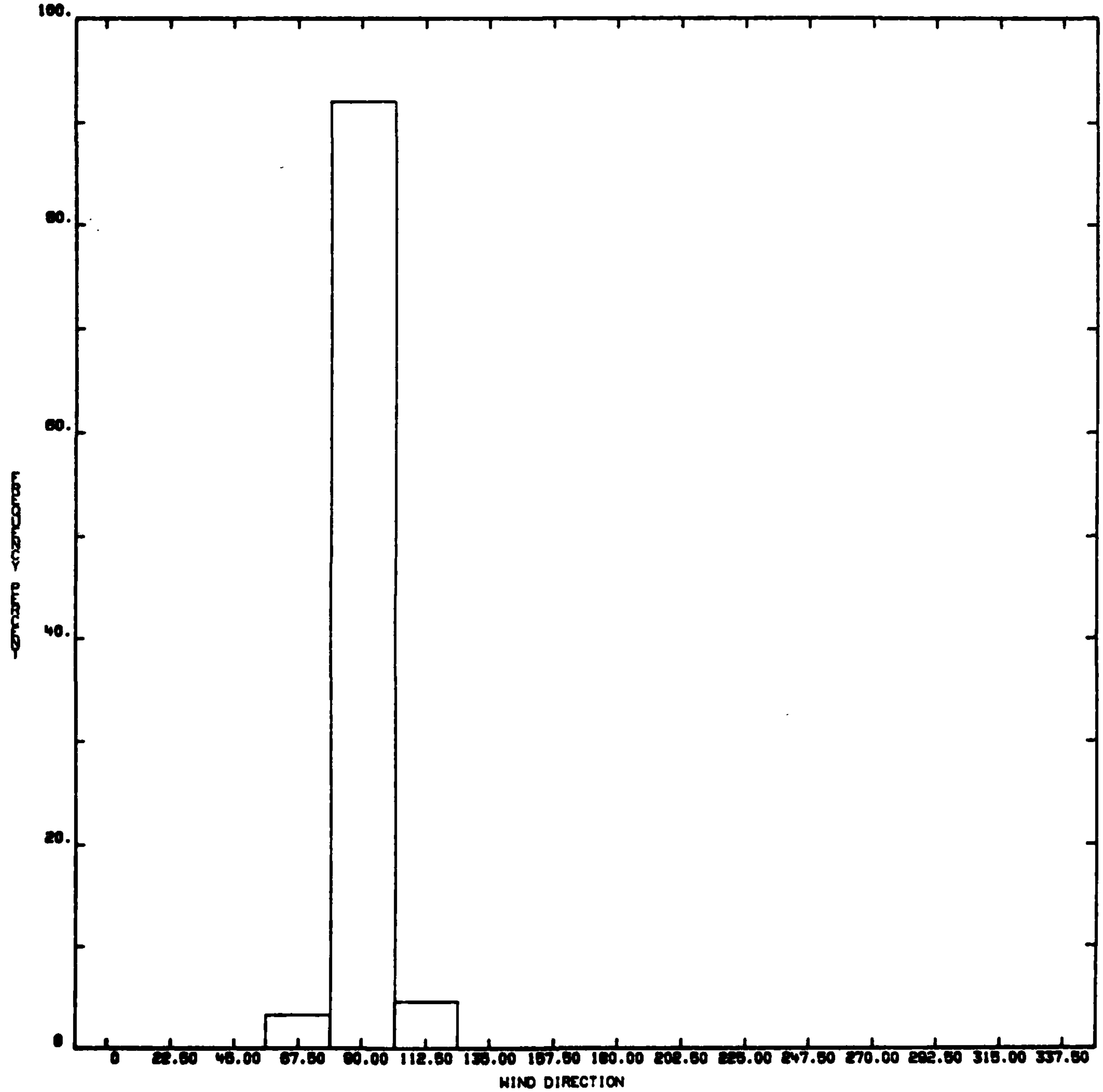


Fig. A-18.

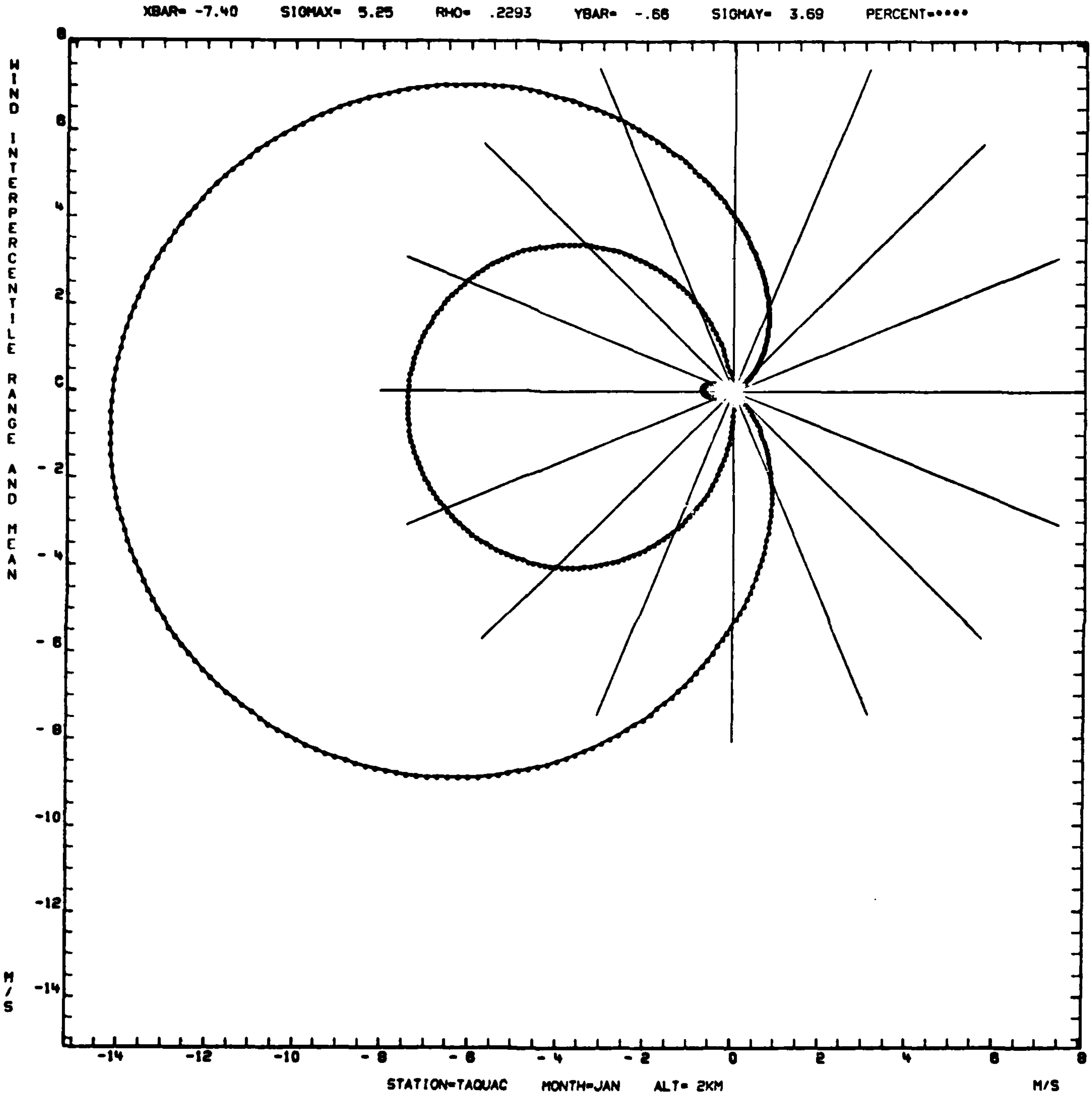
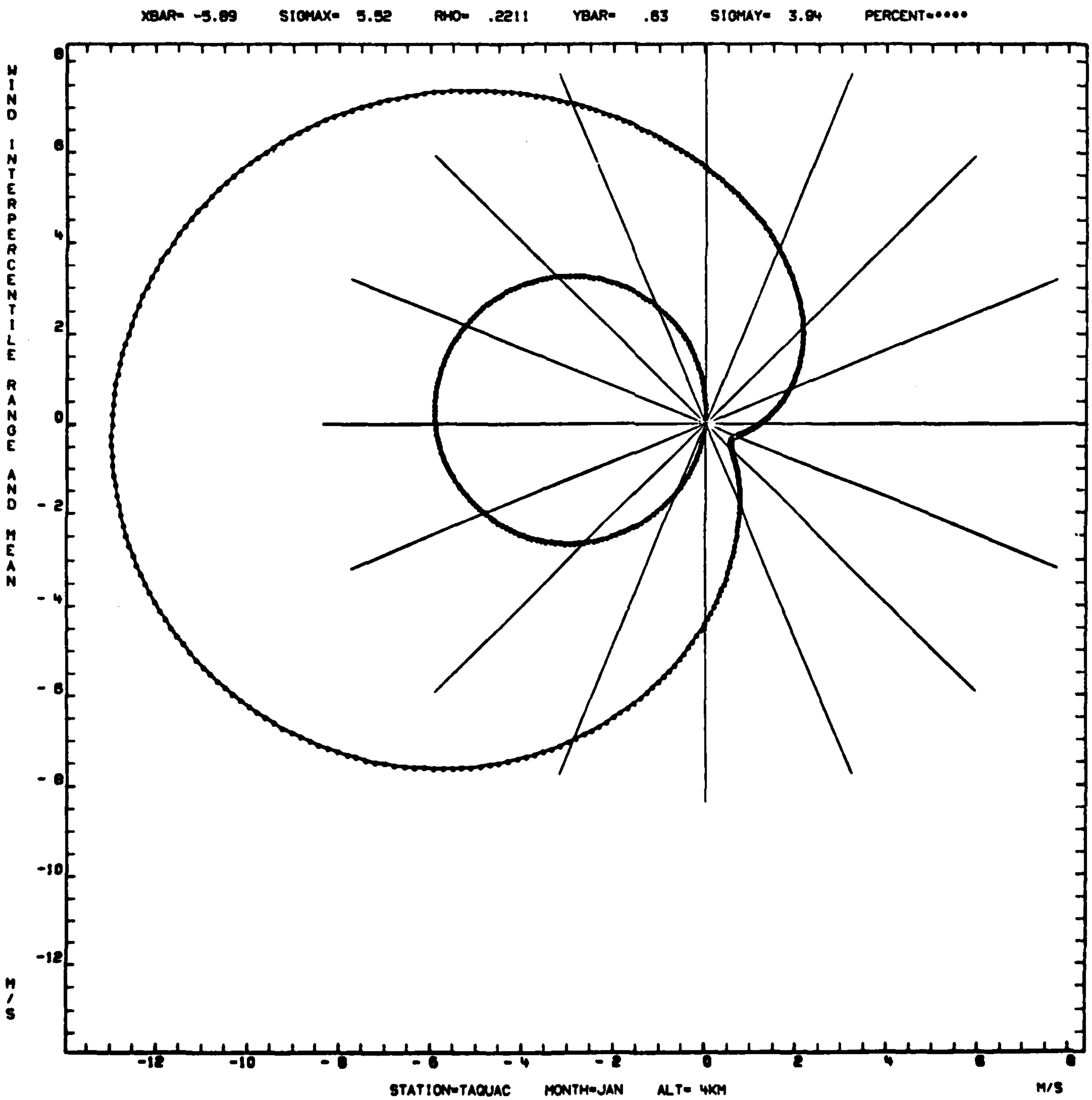

XBAR= -7.40 SIGMAX= 5.25 RHO= .2293 YBAR= -.66 SIGMAY= 3.69 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
STATION=TAQUAC MONTH=JAN ALT= 2KM
M/S

Fig. A-19.



XBAR= -5.89 SIGMAX= 5.52 RHO= .2211 YBAR= .63 SIGMAY= 3.94 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-12
-10
-8
-6
-4
-2
0
2
4
6
8
STATION=TAQUAC MONTH=JAN ALT= 4KM
M/S

Fig. A-20.

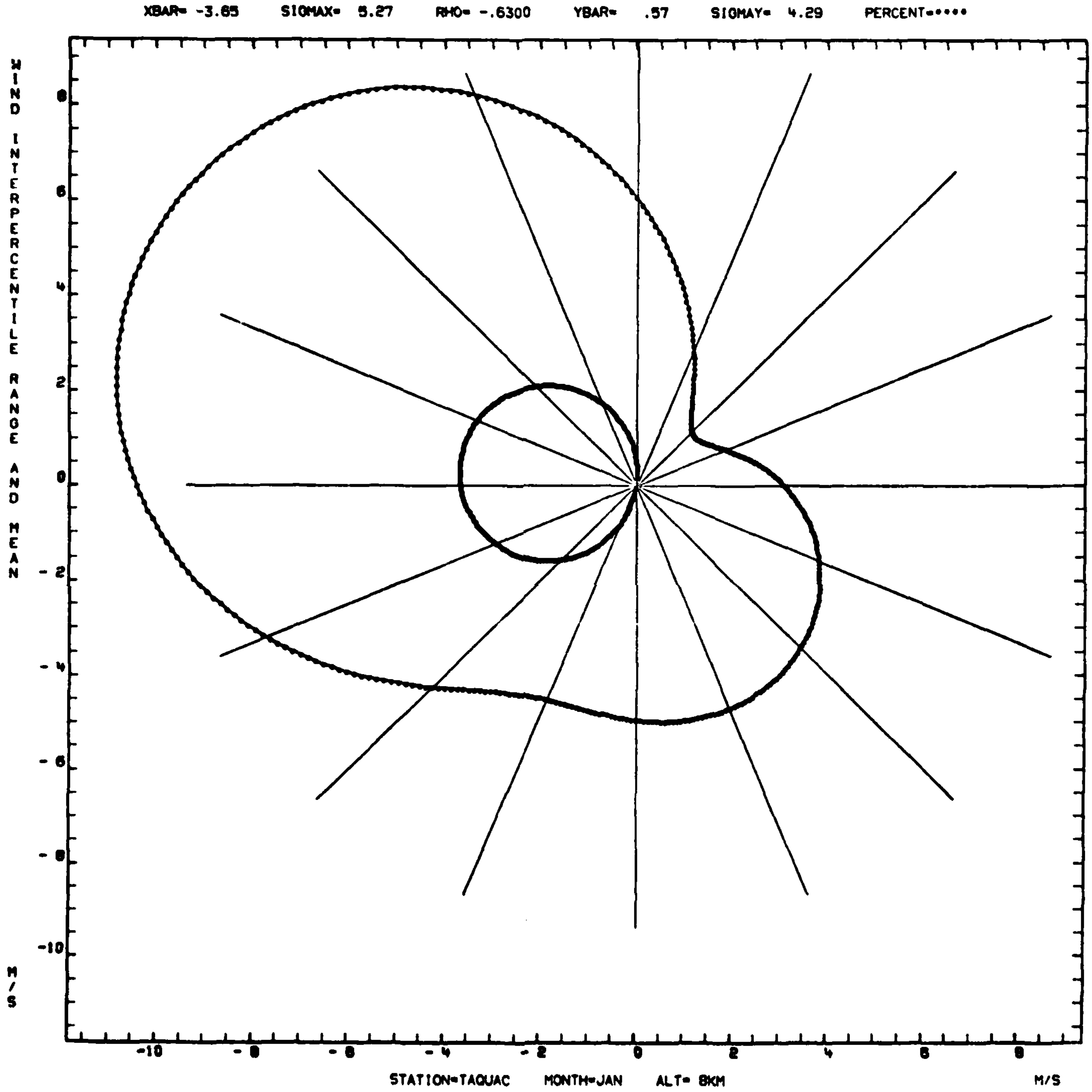
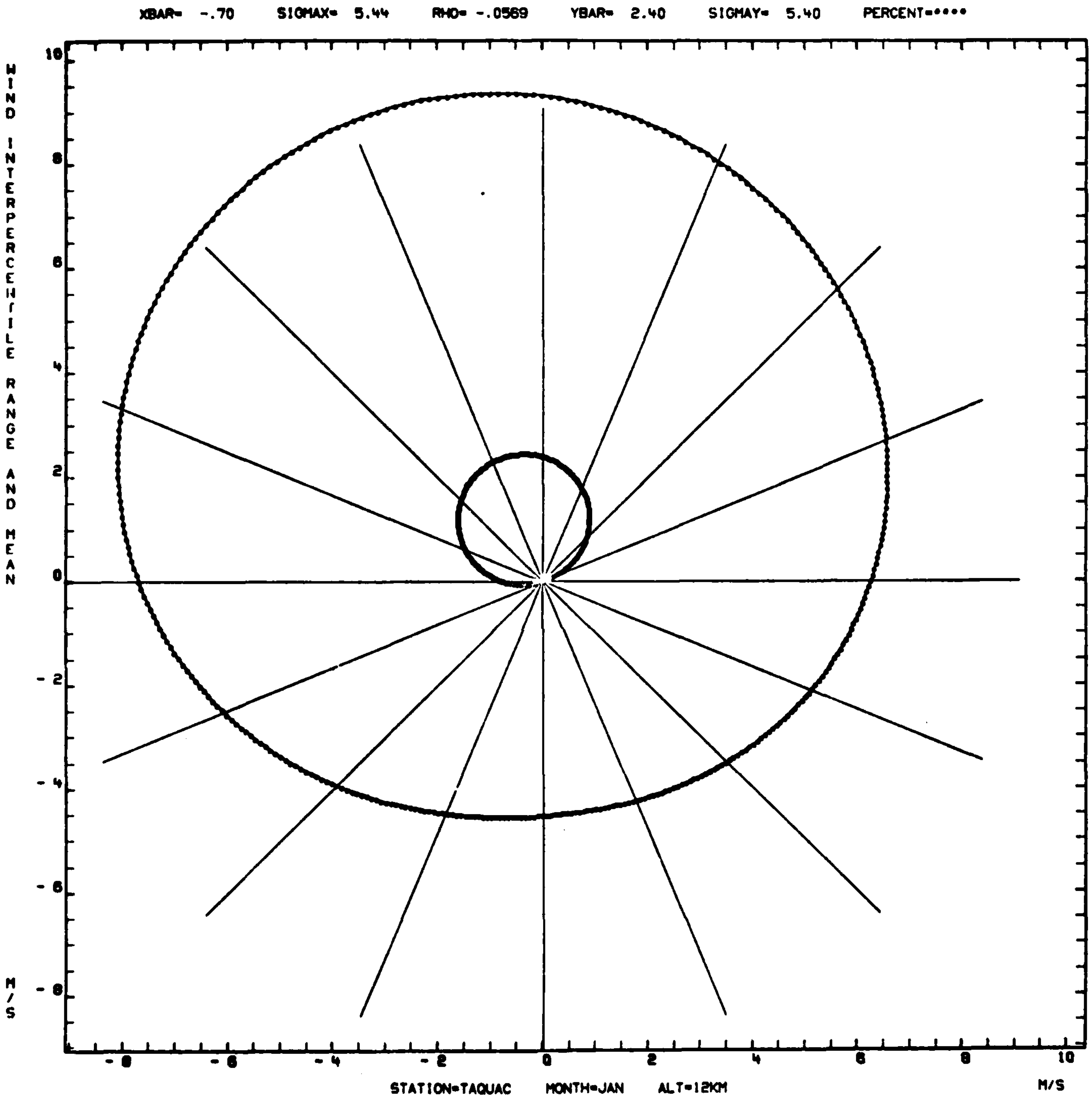
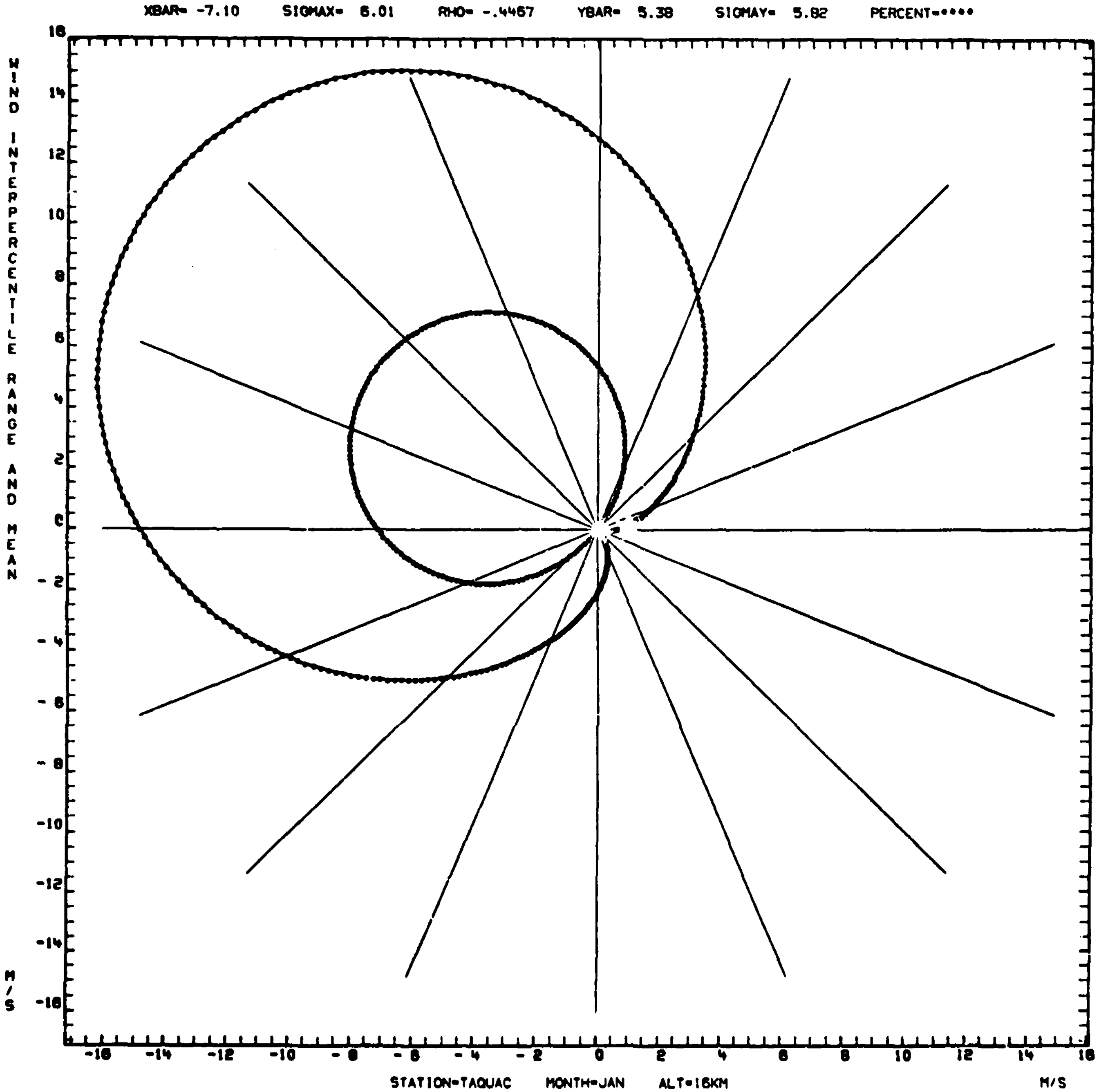

XBAR= -3.85 SIGMAX= 5.27 RHO= -.6300 YBAR= .57 SIGMAY= 4.29 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
8
6
4
2
0
-2
-4
-6
-8
-10
-10
-8
-6
-4
-2
0
2
4
6
8
STATION=TAQUAC MONTH=JAN ALT= 8KM
M/S

Fig. A-21.



XBAR= -.70 SIGMAX= 5.44 RHO= -.0569 YBAR= 2.40 SIGMAY= 5.40 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN M/S
10
8
6
4
2
0
-2
-4
-6
-8
-8 -6 -4 -2 0 2 4 6 8 10
STATION=TAQUAC MONTH=JAN ALT=12KM
M/S

Fig. A-22.



XBAR= -7.10 SIGMAX= 6.01 RHO= -.4467 YBAR= 5.38 SIGMAY= 5.82 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16
STATION=TAQUAC MONTH=JAN ALT=16KM
M/S

Fig. A-23.

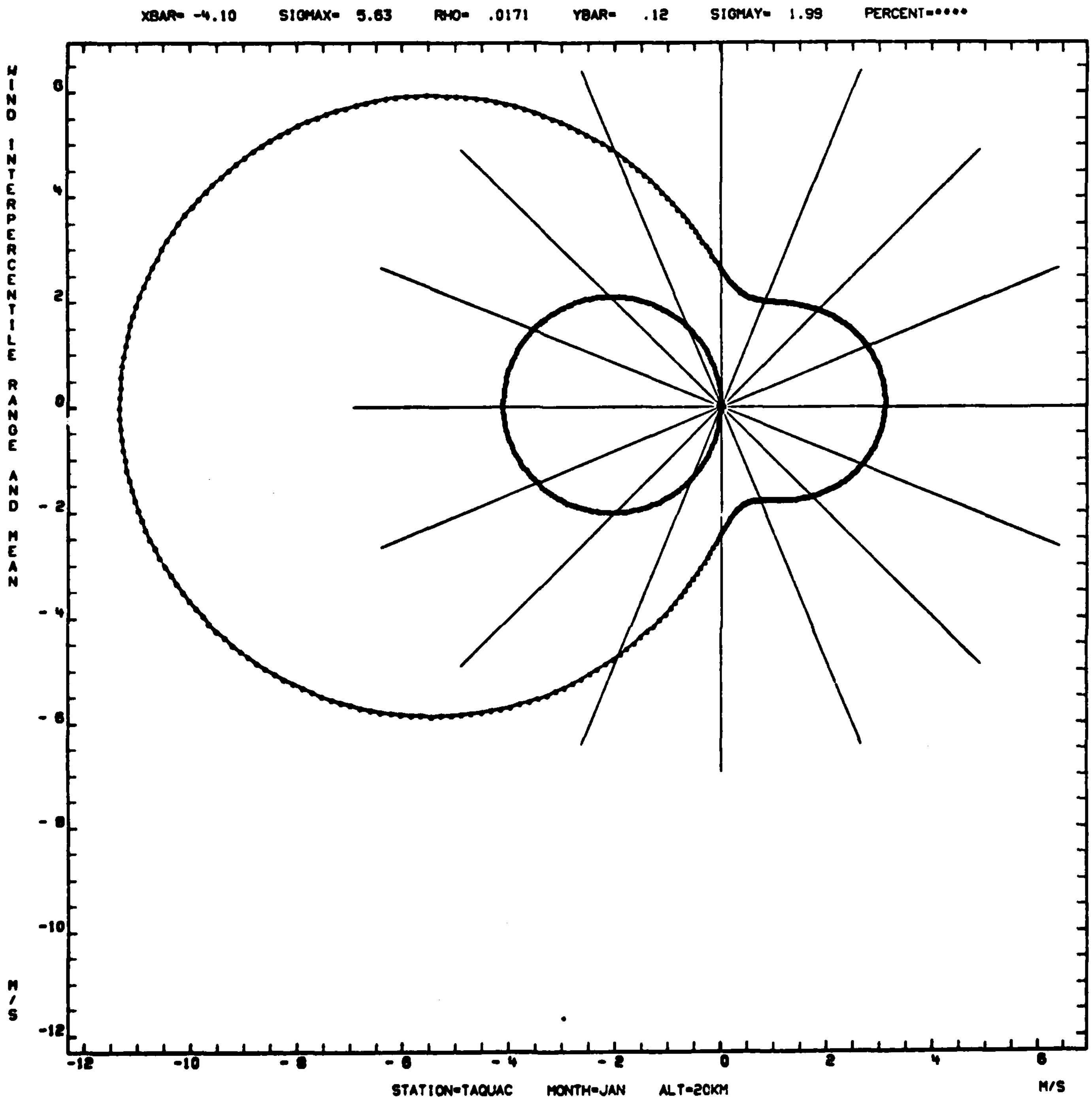

XBAR= -4.10 SIGMAX= 5.63 RHO= .0171 YBAR= .12 SIGMAY= 1.99 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
6
4
2
0
-2
-4
-6
-8
-10
-12
-12 -10 -8 -6 -4 -2 0 2 4 6
STATION=TAQUAC MONTH=JAN ALT=20KM
M/S

Fig. A-24.

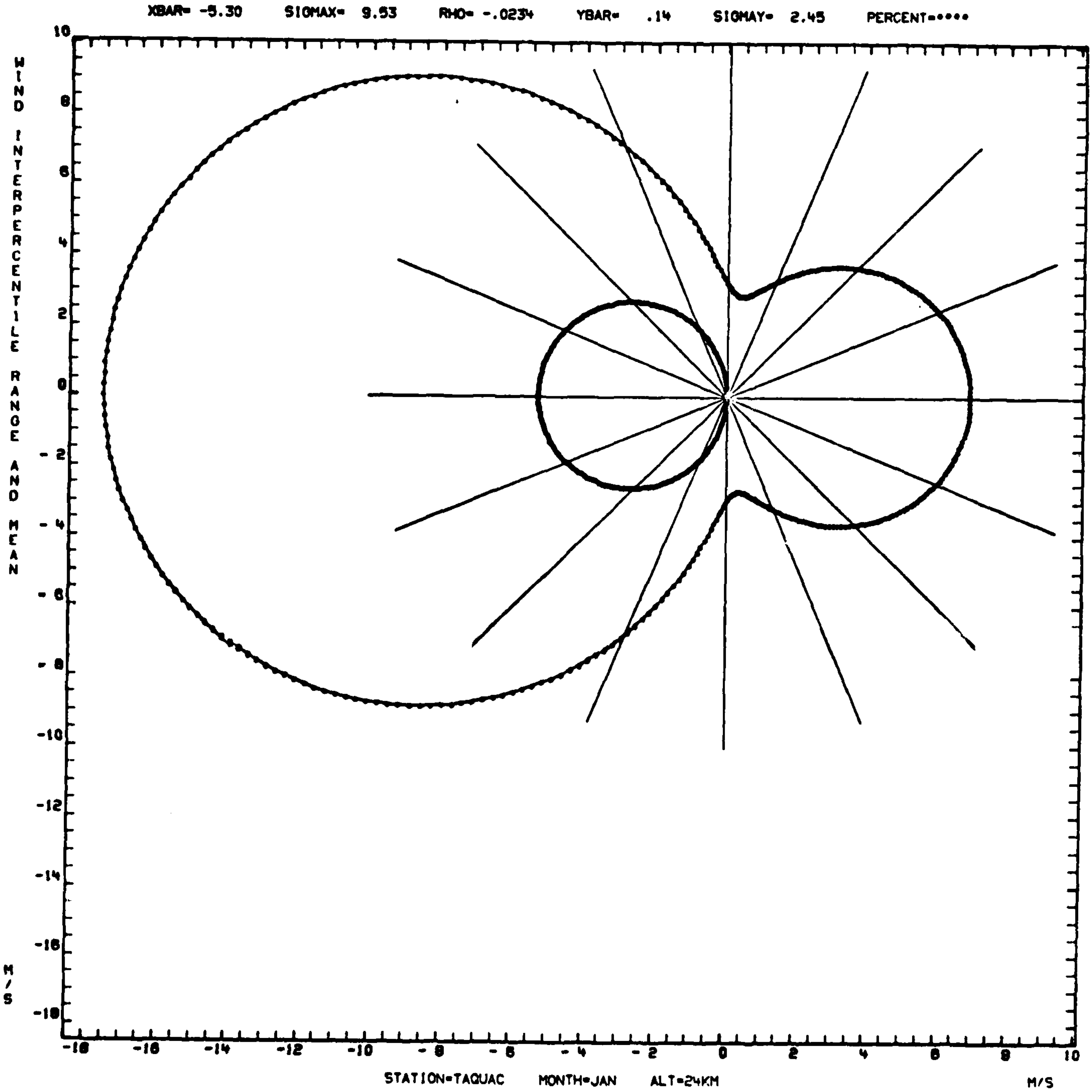

XBAR= -5.30 SIGMAX= 9.53 RHO= -.0234 YBAR= .14 SIGMAY= 2.45 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
STATION=TAQUAC MONTH=JAN ALT=24KM
M/S

Fig. A-25.

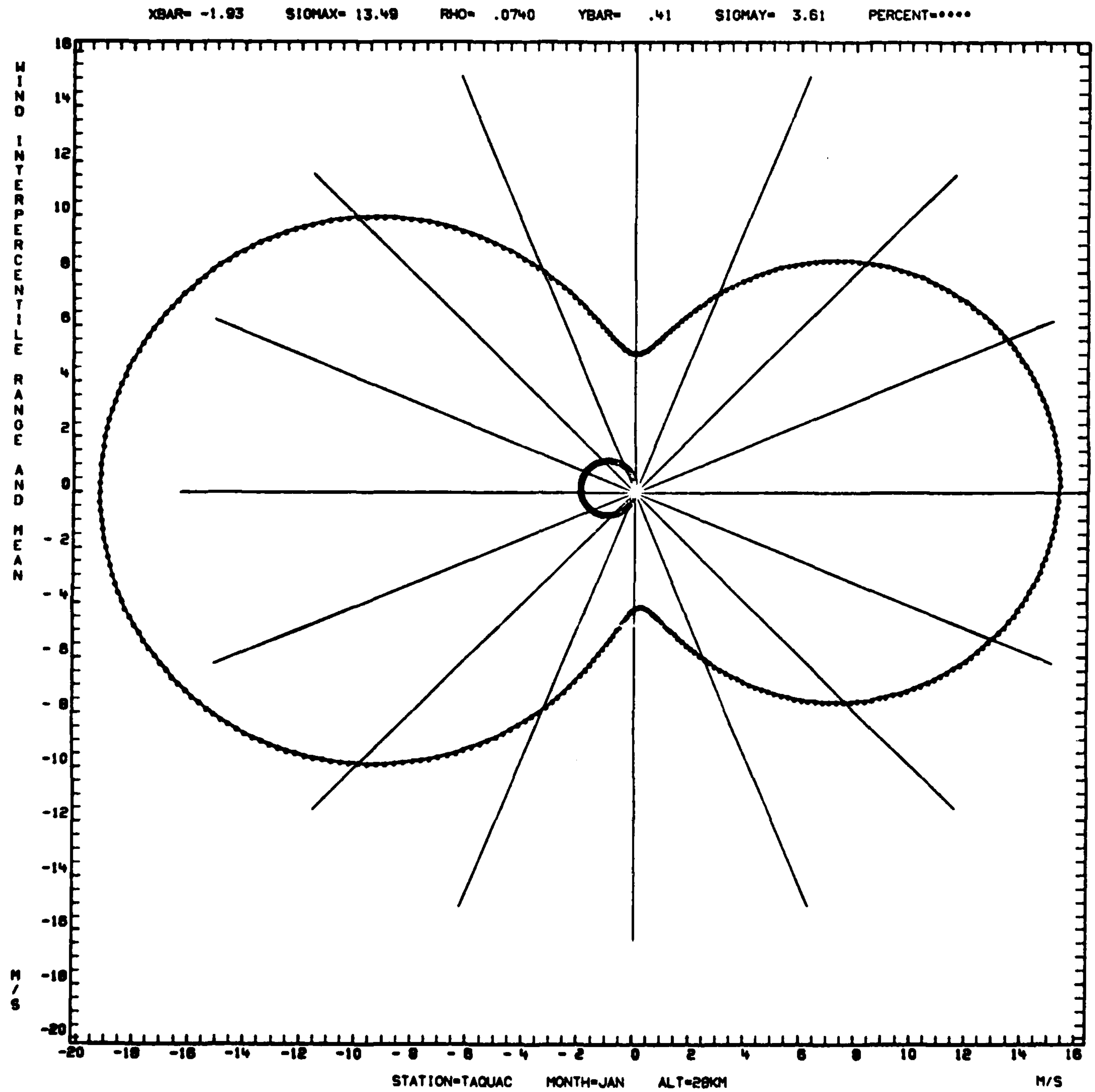

XBAR= -1.93 SIGMAX= 13.49 RHO= .0740 YBAR= .41 SIGMAY= 3.61 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
STATION=TAQUAC MONTH=JAN ALT=28KM
M/S

Fig. A-26.

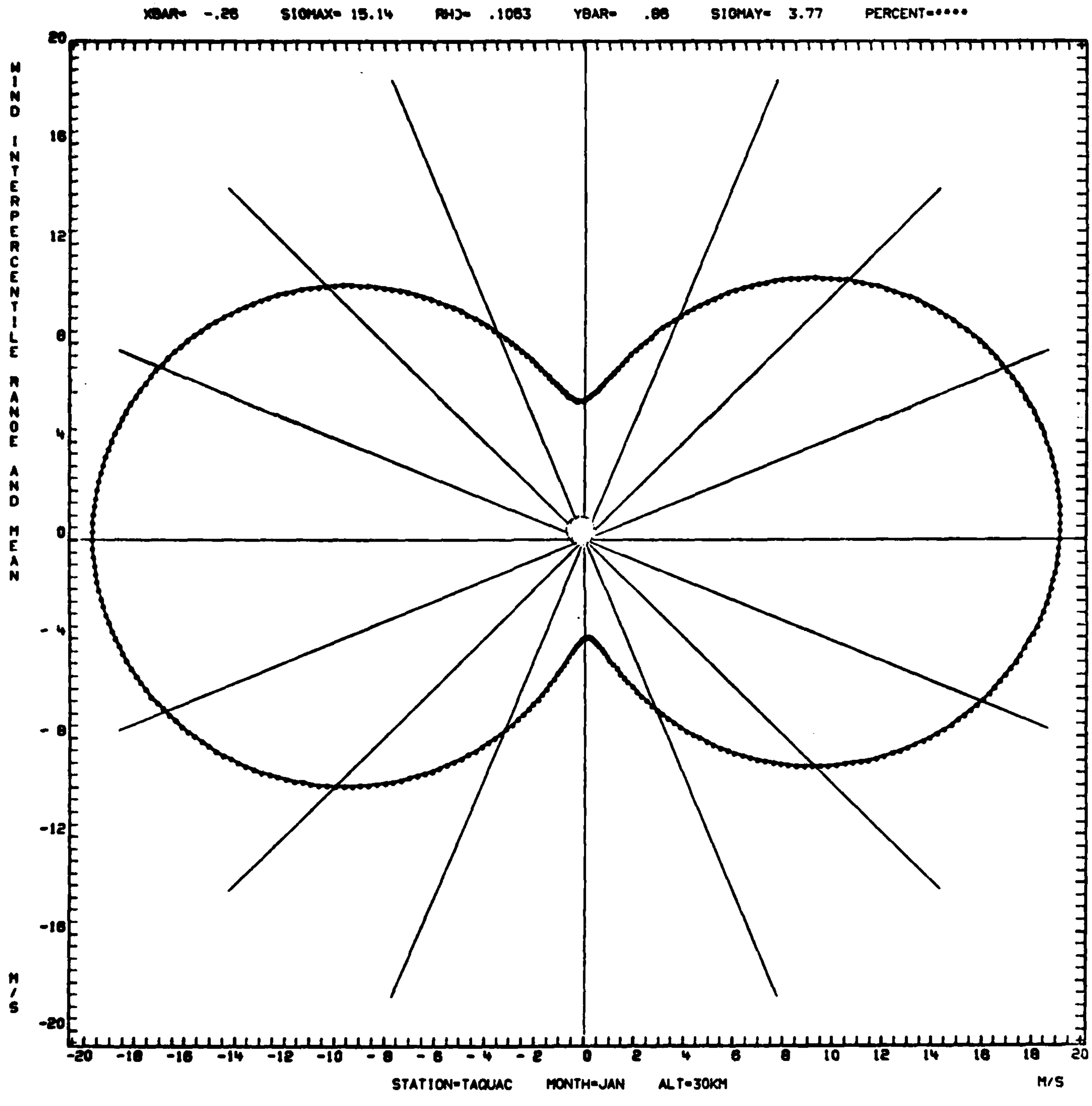

XBAR= -.26 SIGMAX= 15.14 RHO= .1063 YBAR= .86 SIGMAY= 3.77 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN M/S
20
16
12
8
4
0
-4
-8
-12
-16
-20
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
STATION=TAQUAC MONTH=JAN ALT=30KM
M/S

Fig. A-27.

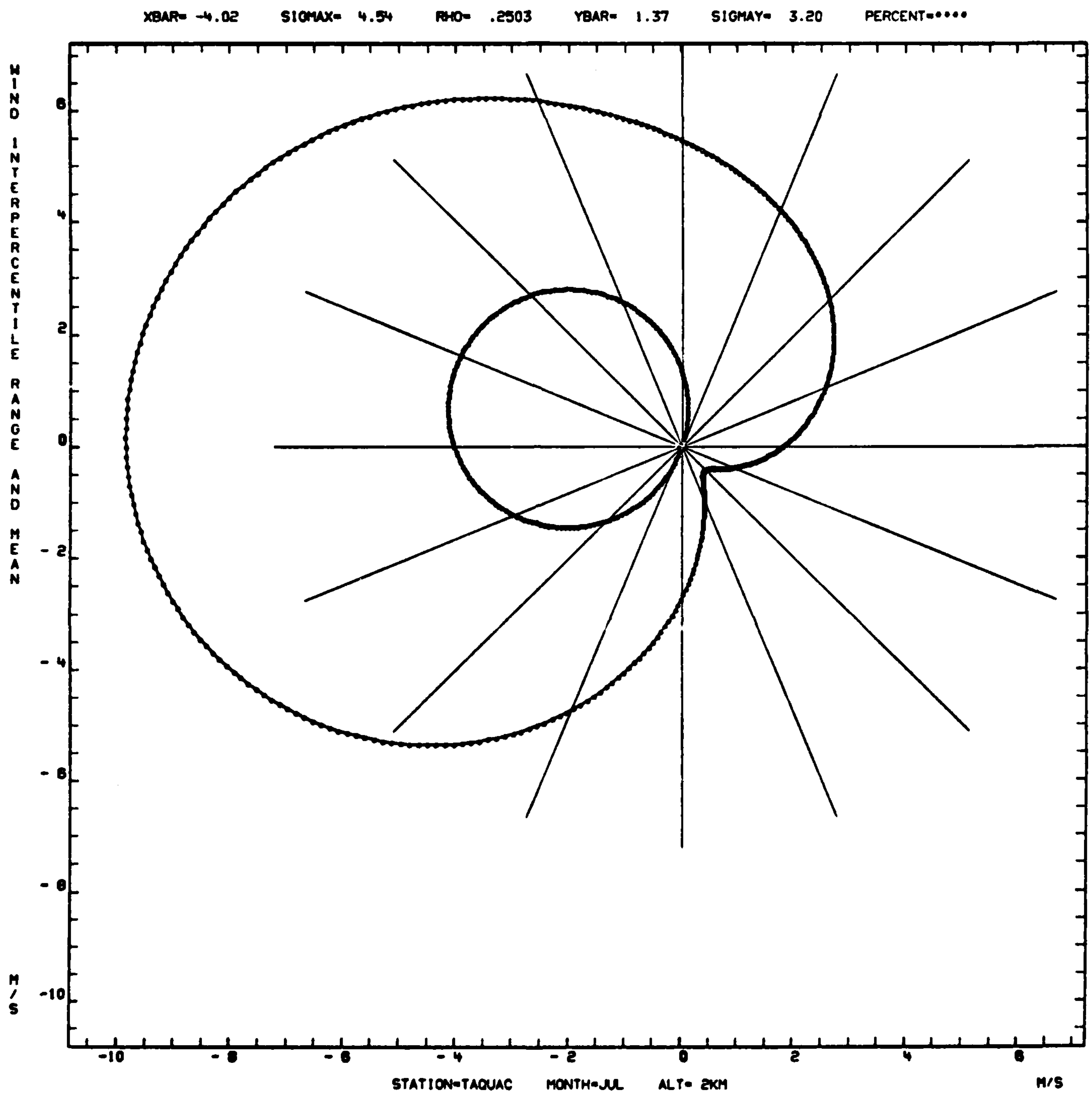
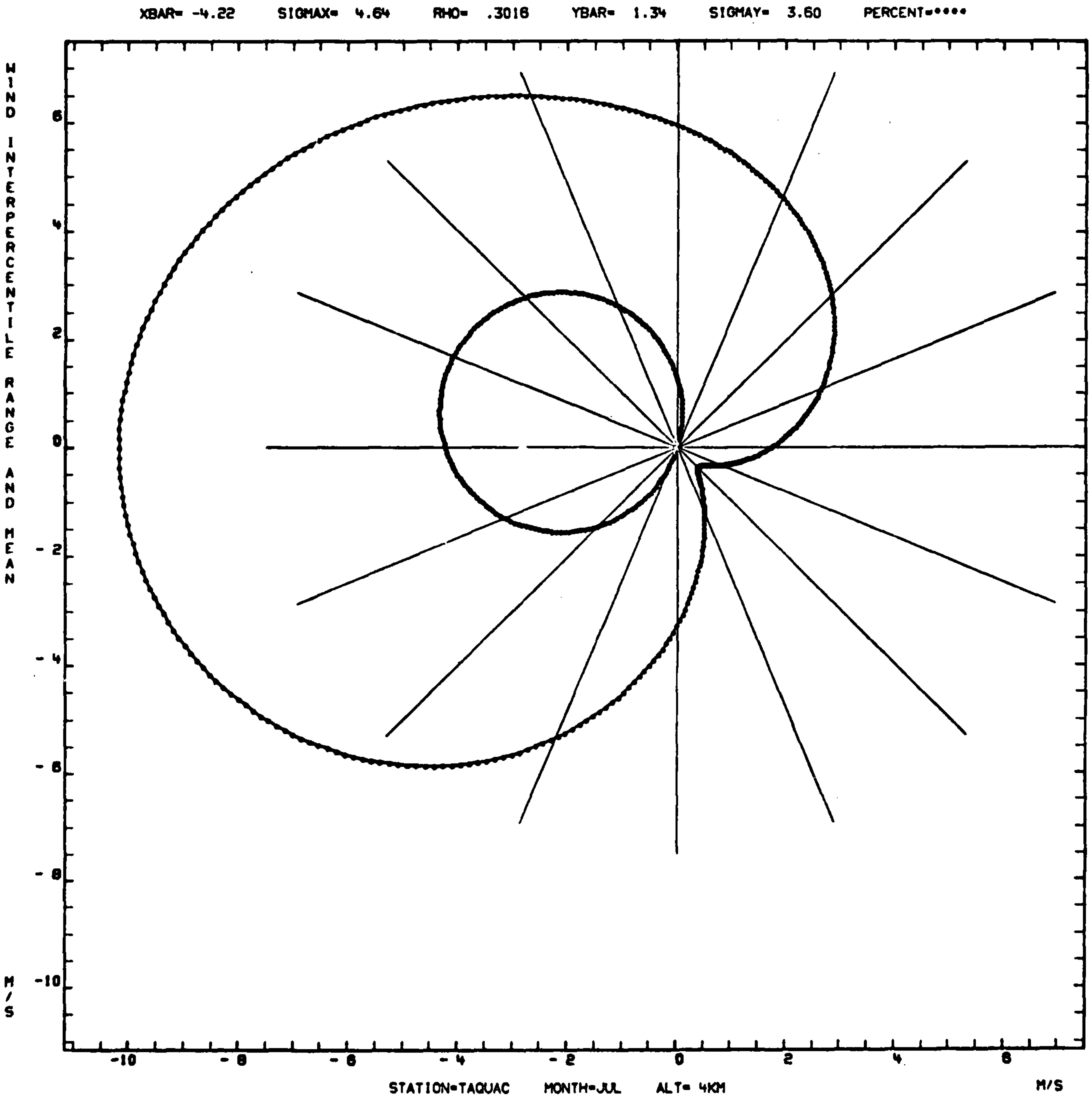

XBAR= -4.02 SIGMAX= 4.54 RHO= .2503 YBAR= 1.37 SIGMAY= 3.20 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
6
4
2
0
-2
-4
-6
-8
-10
-10
-8
-6
-4
-2
0
2
4
6
STATION=TAQUAC MONTH=JUL ALT= 2KM
M/S

Fig. A-28.



XBAR= -4.22 SIGMAX= 4.64 RHO= .3016 YBAR= 1.34 SIGMAY= 3.60 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
6
4
2
0
-2
-4
-6
-8
-10
-8
-6
-4
-2
0
2
4
6
STATION=TAQUAC MONTH=JUL ALT= 4KM
M/S

Fig. A-29.

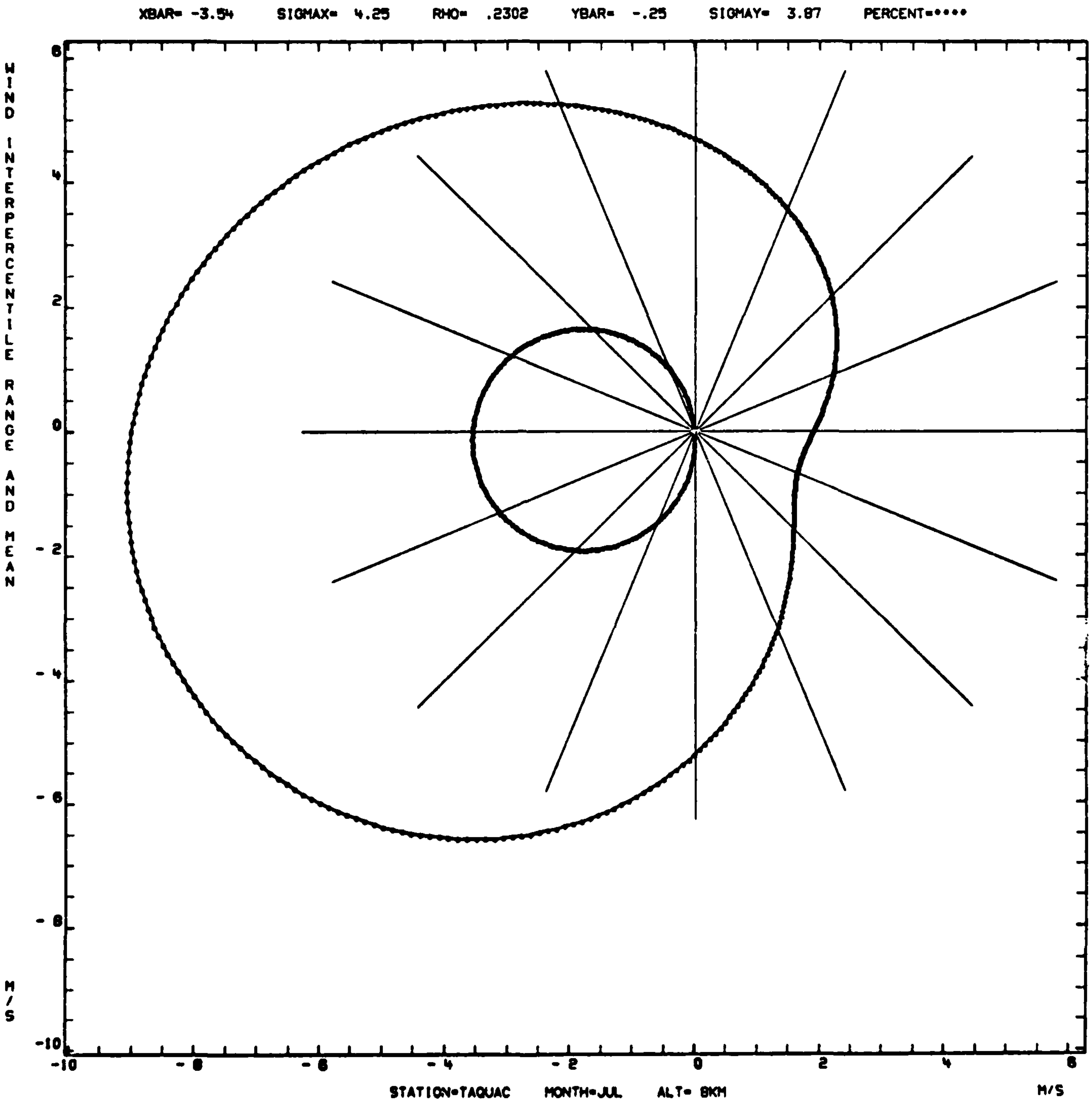

XBAR= -3.54 SIGMAX= 4.25 RHO= .2302 YBAR= -.25 SIGMAY= 3.87 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
6
4
2
0
-2
-4
-6
-8
-10
-10
-8
-6
-4
-2
0
2
4
6
STATION=TAQUAC MONTH=JUL ALT= 8KM
M/S

Fig. A-30.

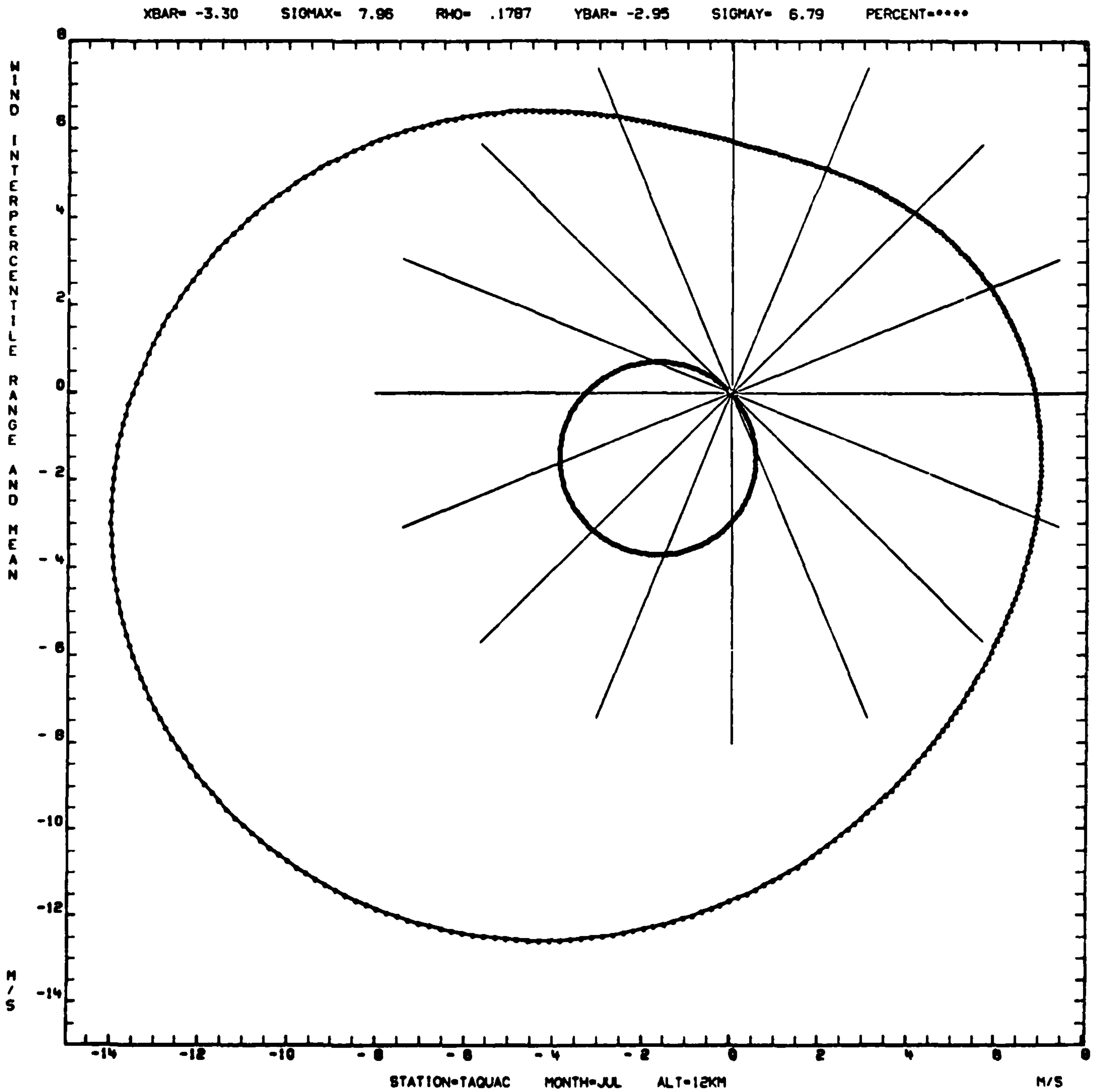

XBAR= -3.30 SIGMAX= 7.96 RHO= .1787 YBAR= -2.95 SIGMAY= 6.79 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-14 -12 -10 -8 -6 -4 -2 0 2 4 6 8
STATION=TAQUAC MONTH=JUL ALT=12KM
M/S

Fig. A-31.

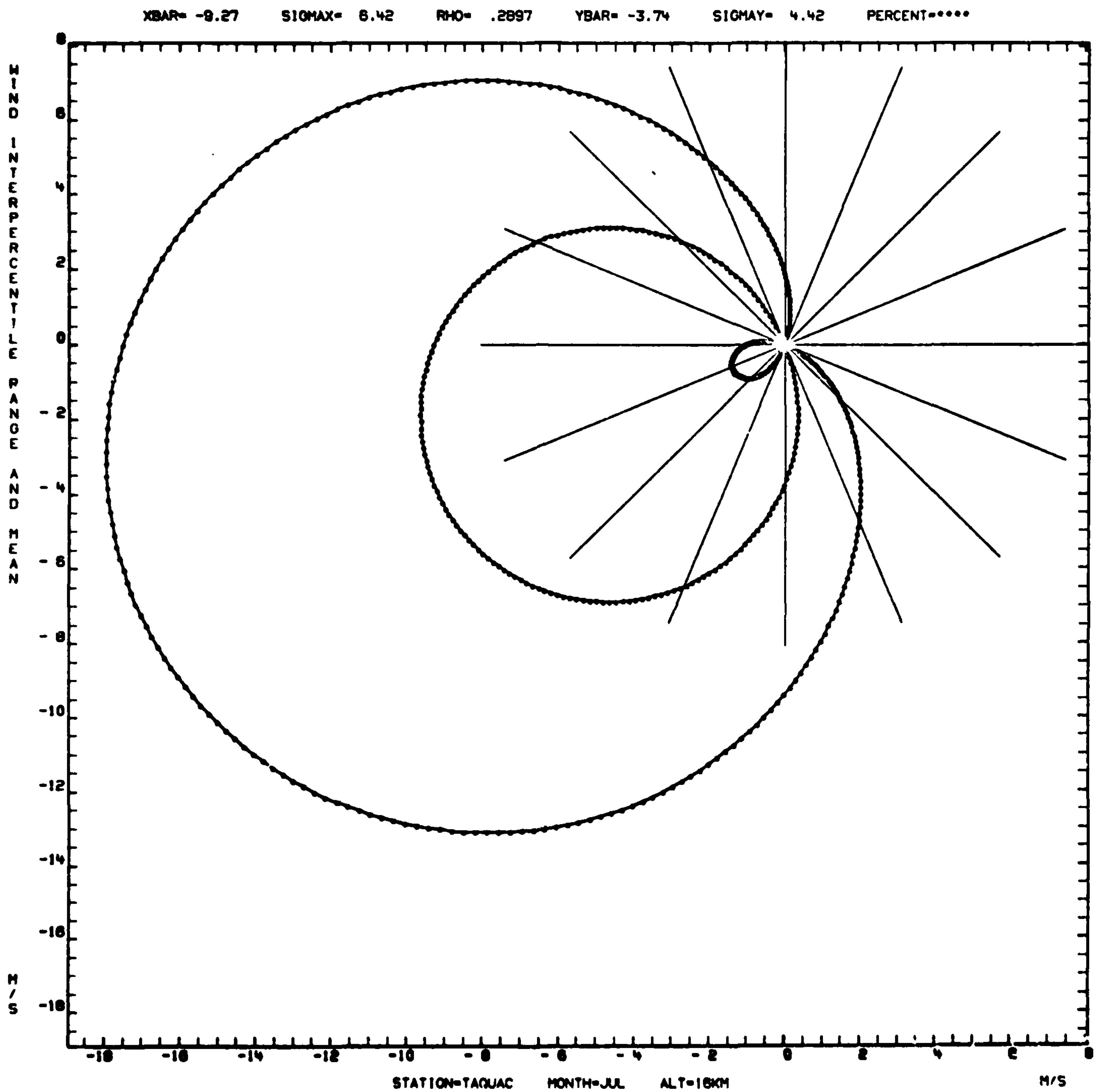

XBAR= -9.27 SIGMAX= 8.42 RHO= .2897 YBAR= -3.74 SIGMAY= 4.42 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
STATION=TAQUAC MONTH=JUL ALT=16KM
M/S

Fig. A-32.

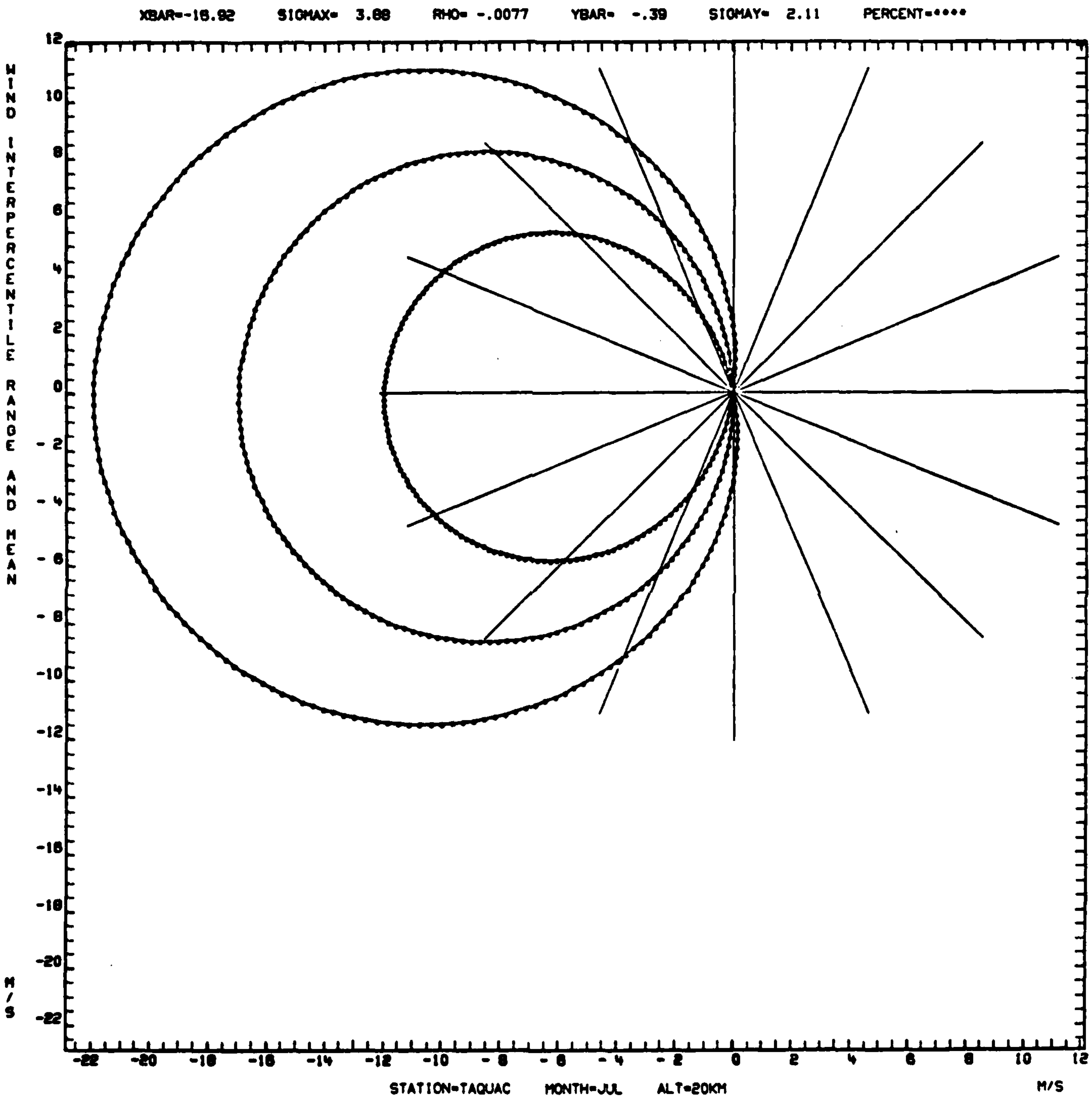

XBAR=-16.92 SIGMAX= 3.88 RHO= -.0077 YBAR= -.39 SIGMAY= 2.11 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12
STATION=TAQUAC MONTH=JUL ALT=20KM
M/S

Fig. A-33.

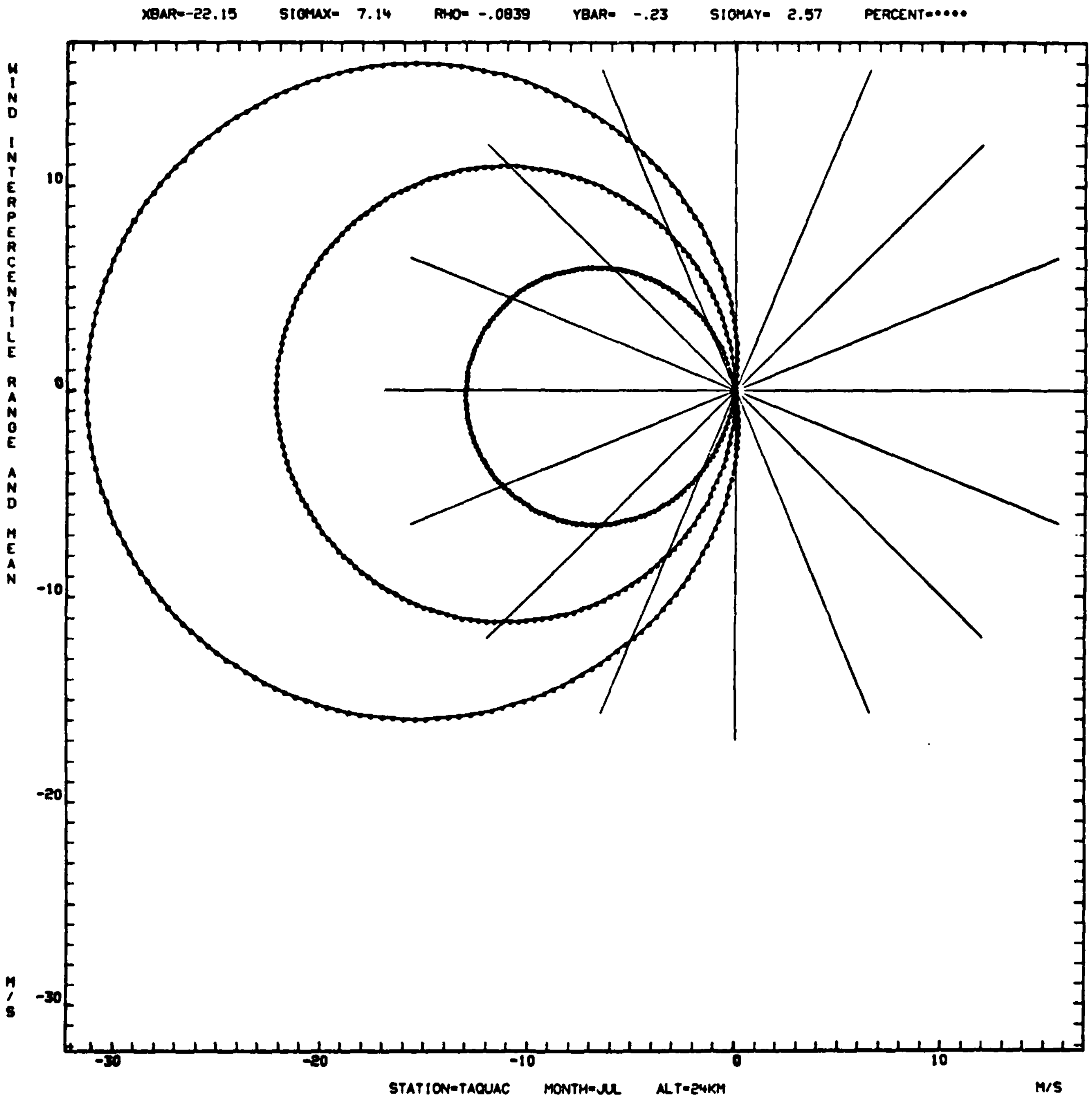

XBAR=-22.15 SIGMAX= 7.14 RHO= -.0839 YBAR= -.23 SIGMAY= 2.57 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
10
0
-10
-20
-30
-30
-20
-10
0
10
STATION=TAQUAC MONTH=JUL ALT=24KM
M/S

Fig. A-34.

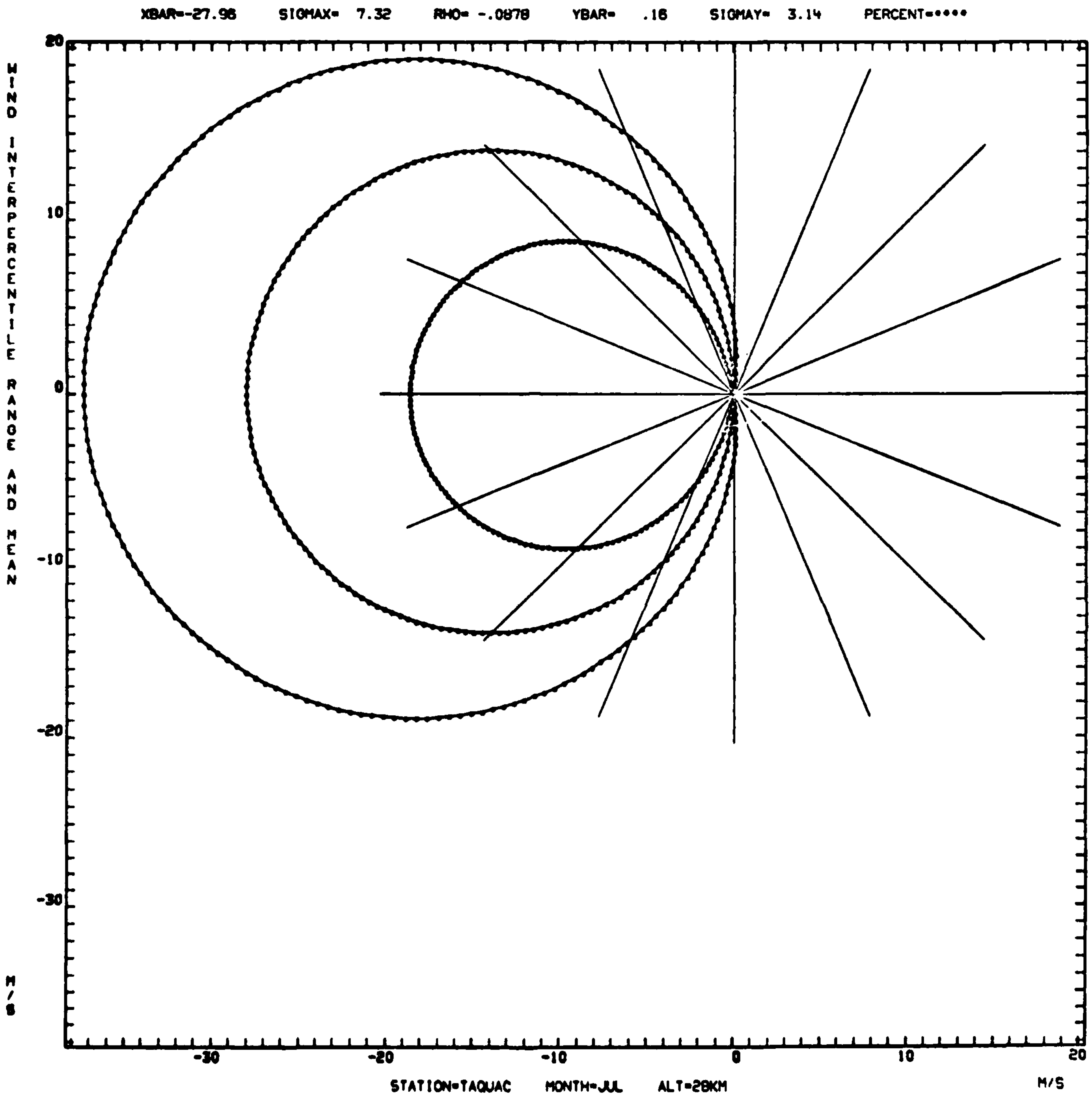

XBAR=-27.96 SIGMAX= 7.32 RHO= -.0878 YBAR= .16 SIGMAY= 3.14 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
20
10
0
-10
-20
-30
-30
-20
-10
0
10
20
STATION=TAQUAC MONTH=JUL ALT=28KM
M/S

Fig. A-35.

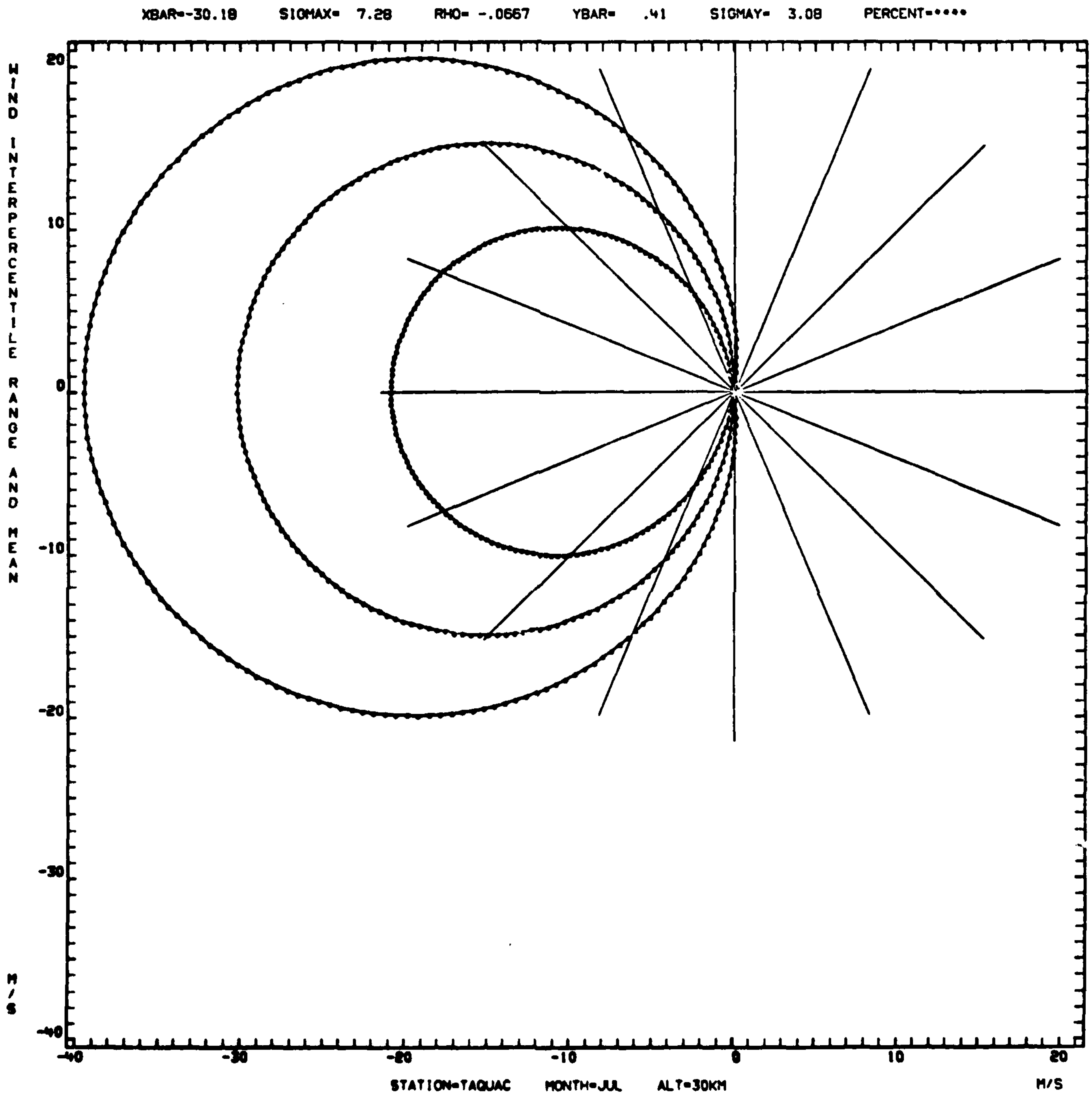

XBAR=-30.18 SIGMAX= 7.28 RHO= -.0667 YBAR= .41 SIGMAY= 3.08 PERCENT=****
WIND INTERPERCENTILE RANGE AND MEAN
M/S
20
10
0
-10
-20
-30
-40
-40
-30
-20
-10
0
10
20
STATION=TAGUAC MONTH=JUL ALT=30KM
M/S

Fig. A-36.

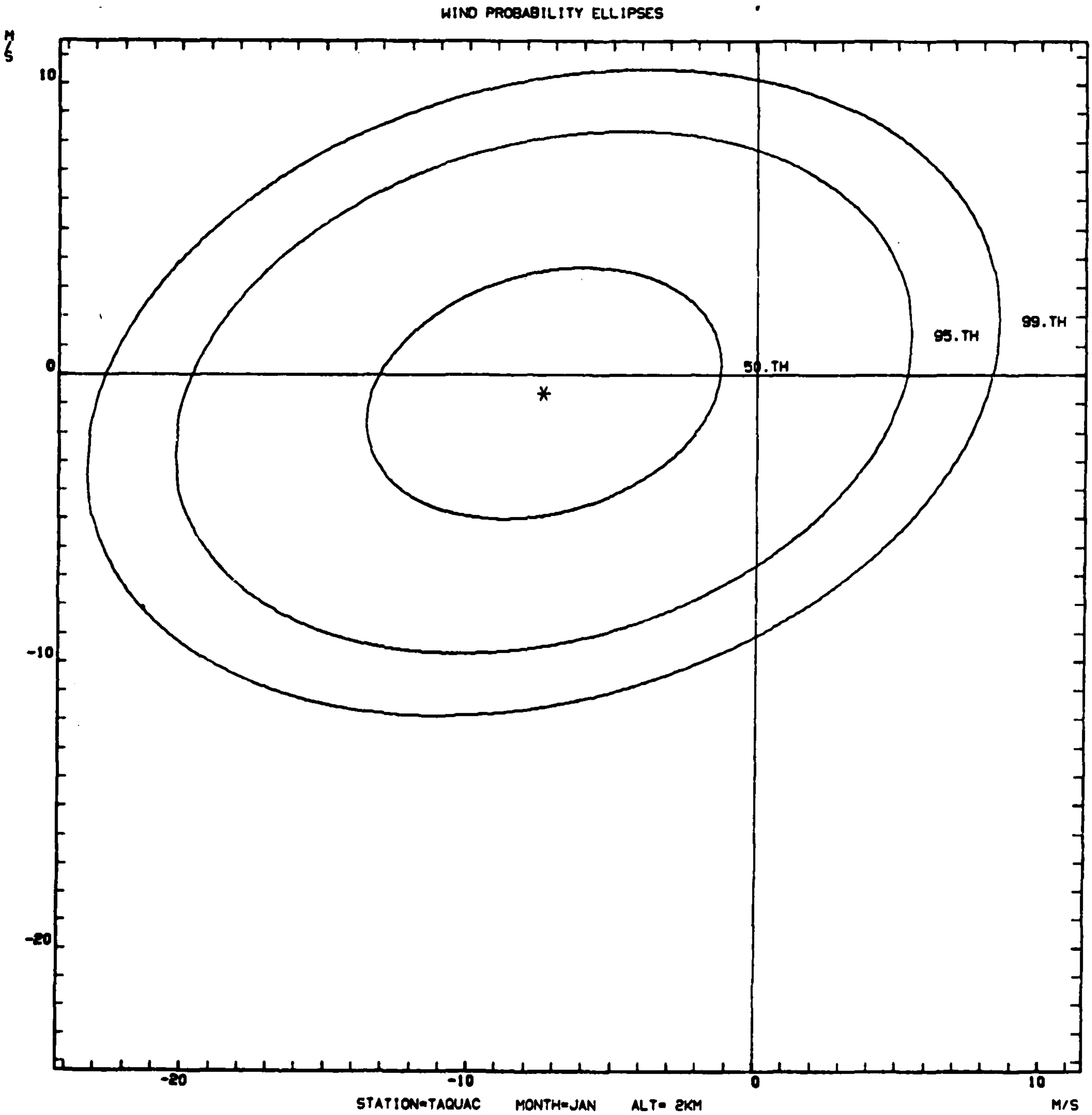

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
50.TH
95.TH
99.TH
-20
-10
0
10
STATION=TAQUAC MONTH=JAN ALT= 2KM
M/S

Fig. A-37.

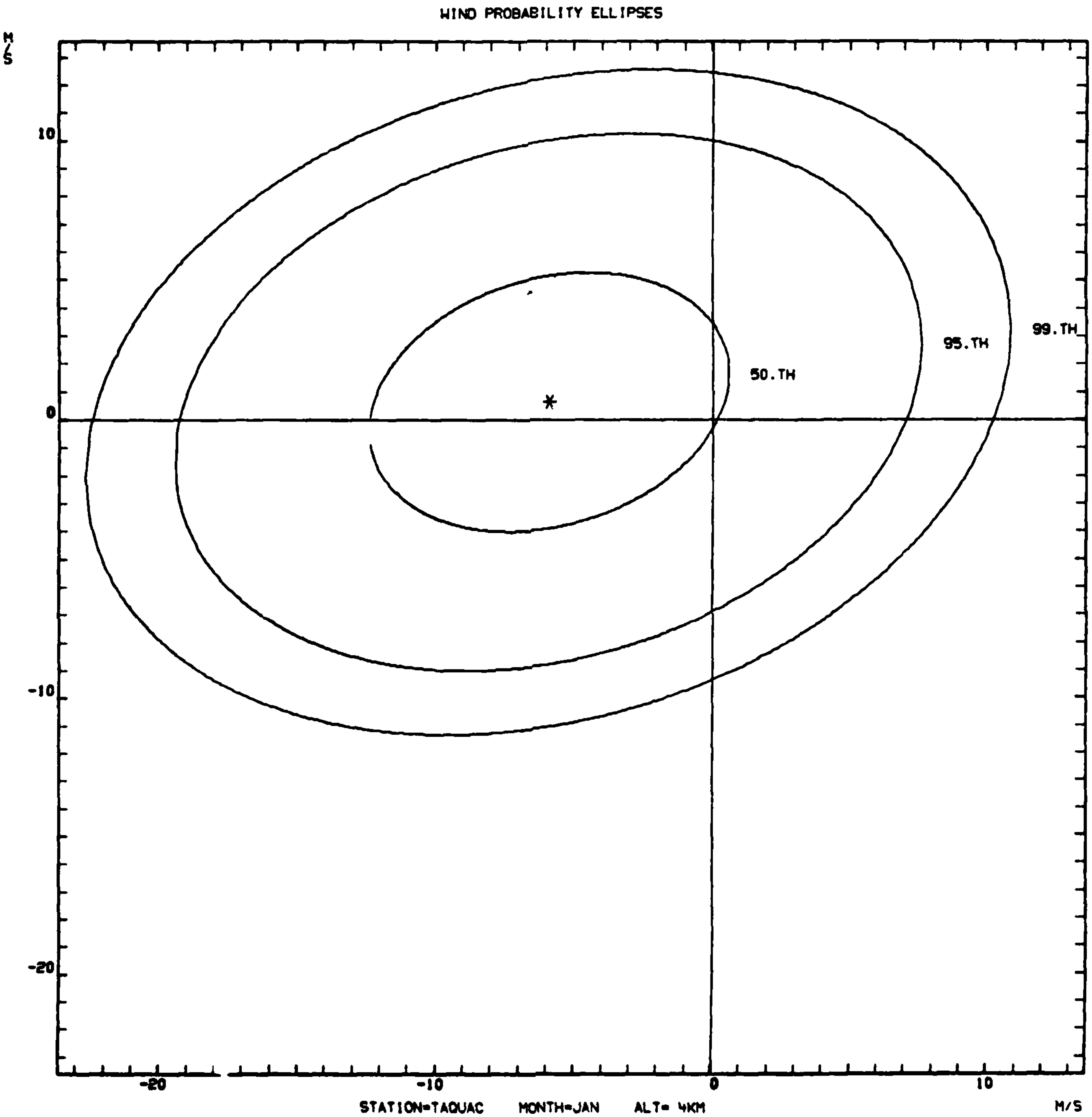

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
50.TH
95.TH
99.TH
-20
-10
0
10
M/S
STATION=TAQUAC MONTH=JAN ALT= 4KM

Fig. A-38.

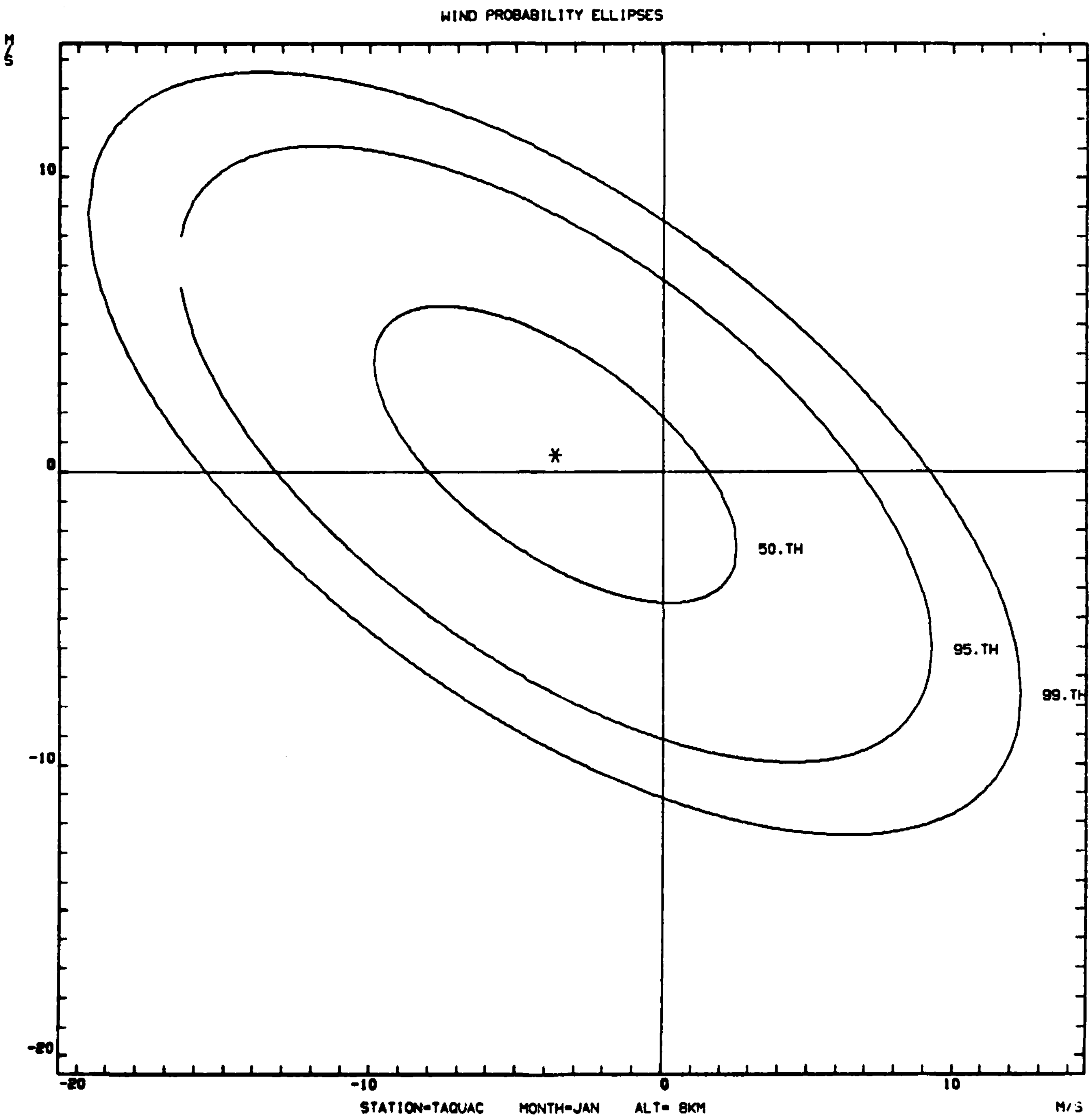
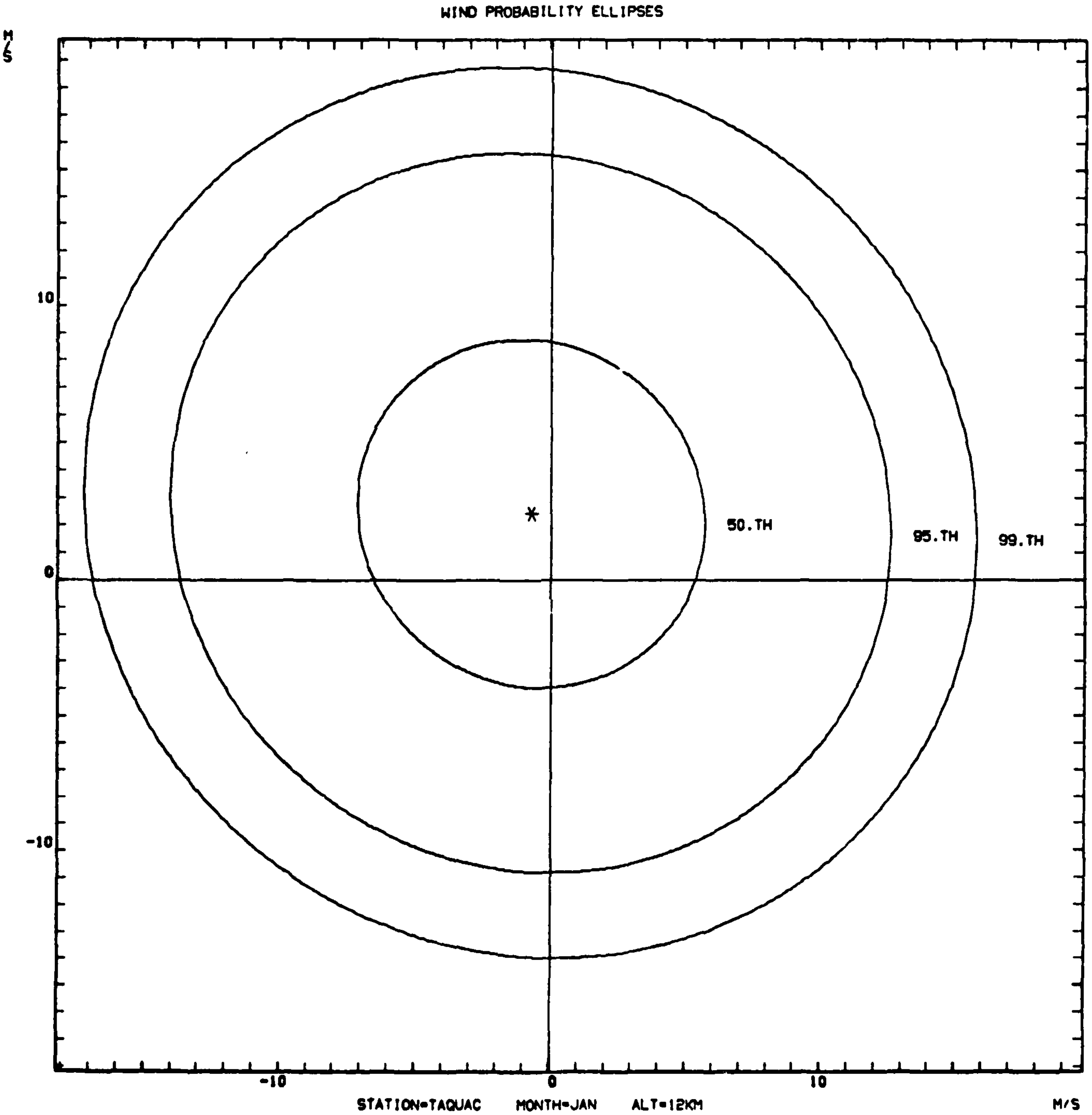

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
50.TH
95.TH
99.TH
-20
-10
0
10
STATION=TAQUAC MONTH=JAN ALT= 8KM
M/S

Fig. A-39.



WIND PROBABILITY ELLIPSES
M/S
10
0
-10
50.TH
95.TH
99.TH
-10
0
10
STATION=TAQUAC MONTH=JAN ALT=12KM
M/S

Fig. A-40.

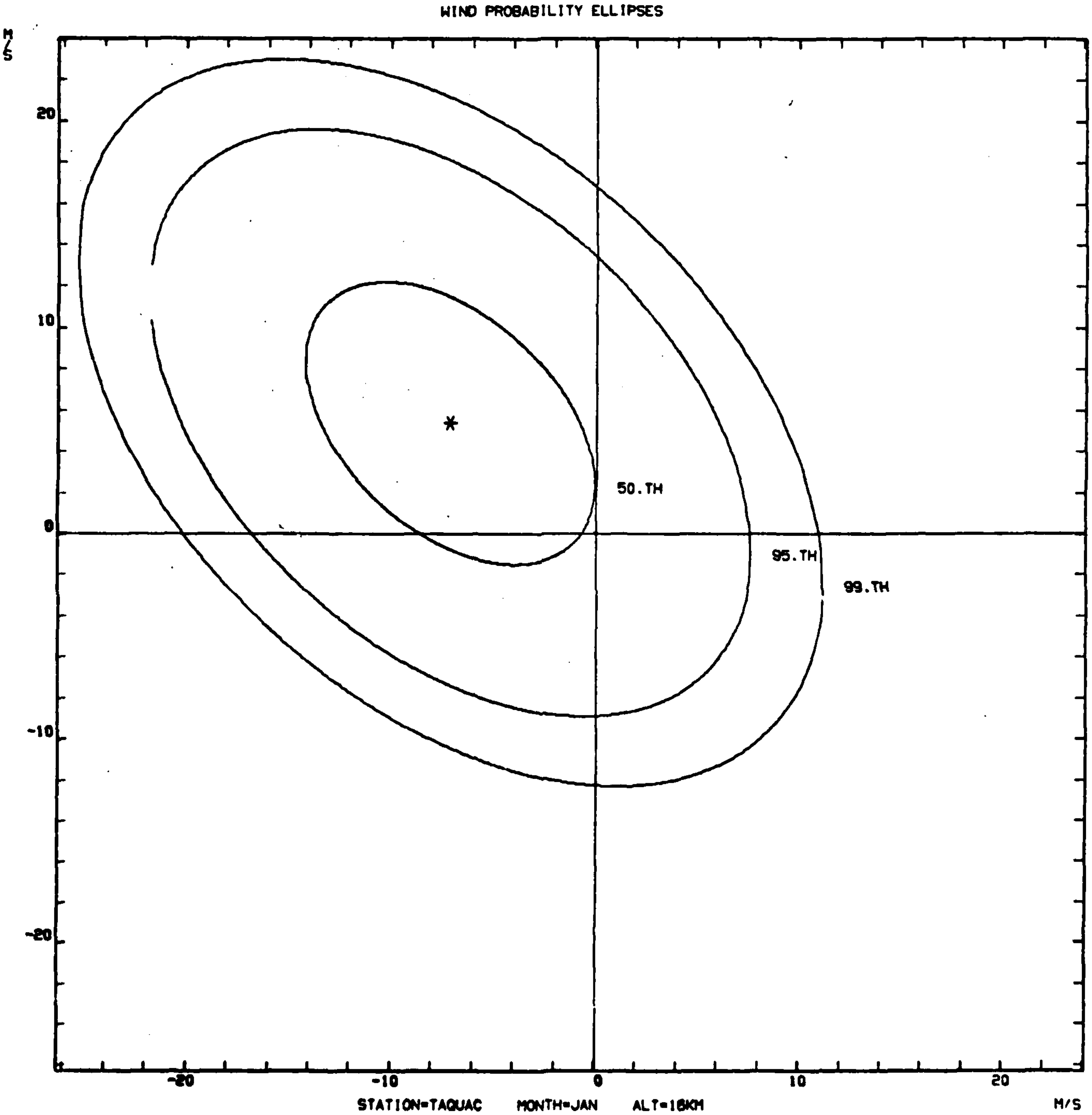

WIND PROBABILITY ELLIPSES
M/S
20
10
0
-10
-20
-20
-10
0
10
20
M/S
50.TH
95.TH
99.TH
STATION=TAQUAC MONTH=JAN ALT=16KM

Fig. A-41.

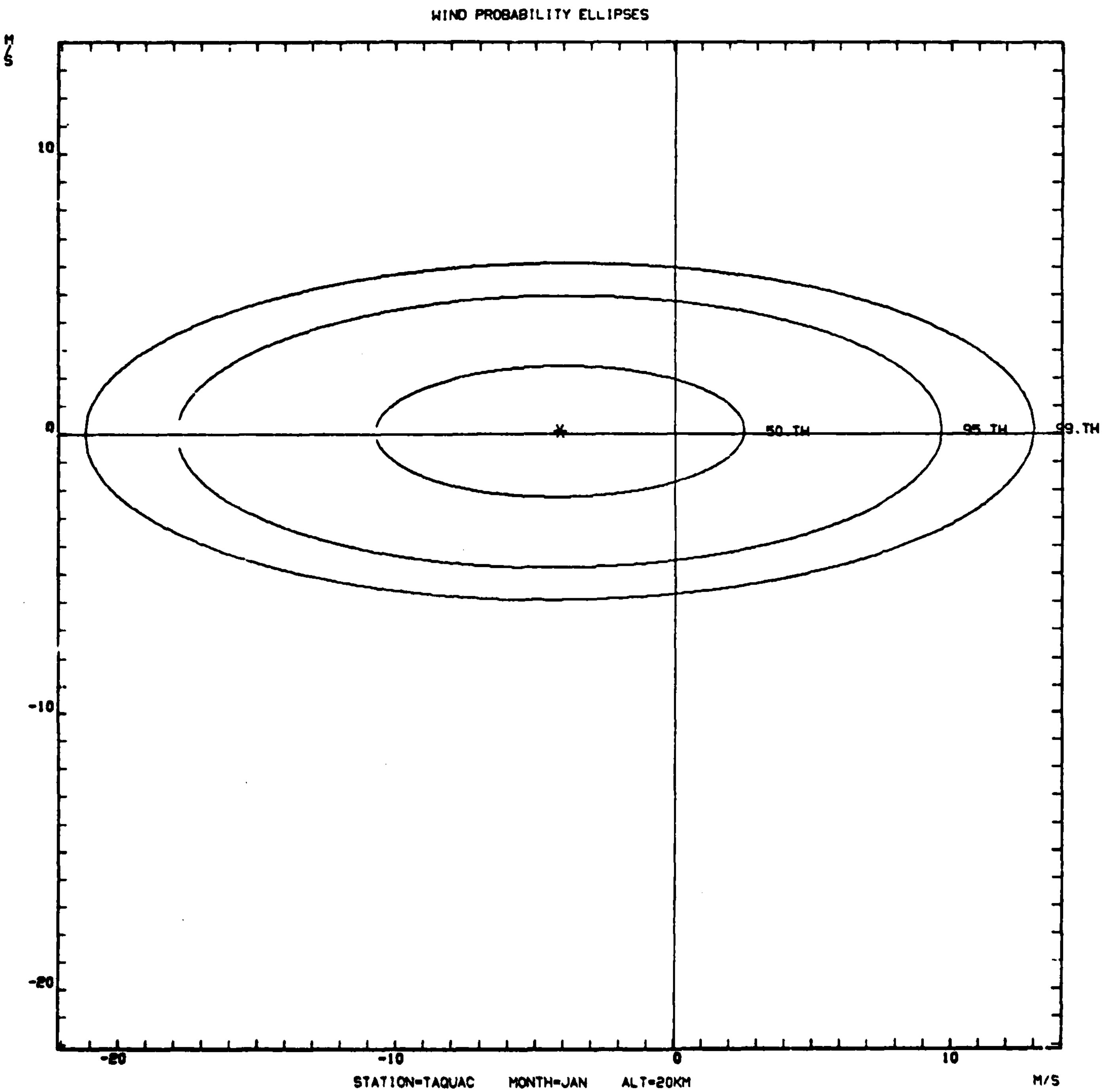

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
50.TH
95.TH
99.TH
-20
-10
0
10
M/S
STATION=TAQUAC MONTH=JAN ALT=20KM

Fig. A-42.

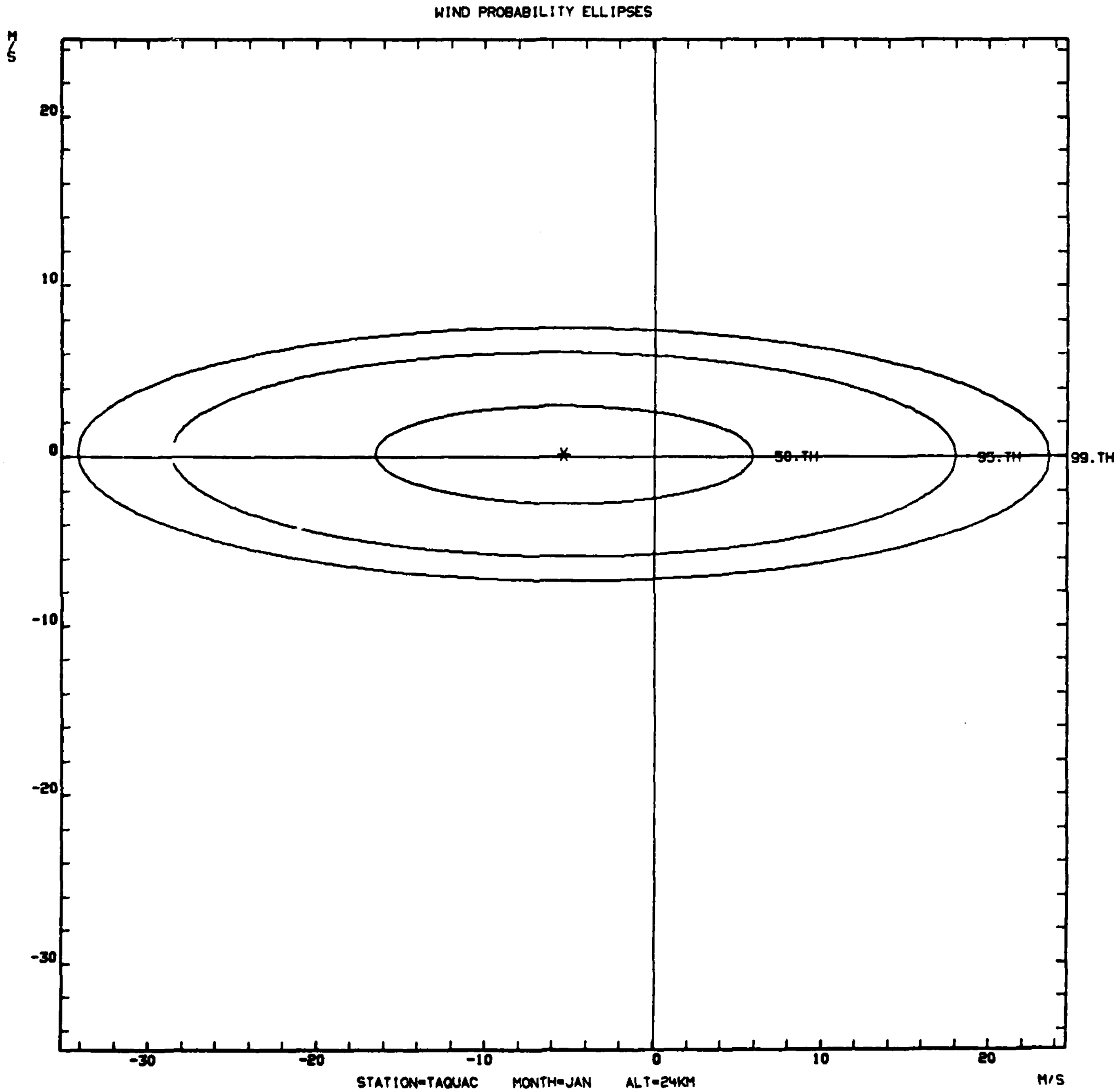

WIND PROBABILITY ELLIPSES
M/S
20
10
0
-10
-20
-30
-30
-20
-10
0
10
20
M/S
50.TH
95.TH
99.TH
STATION=TAQUAC MONTH=JAN ALT=24KM

Fig. A-43.

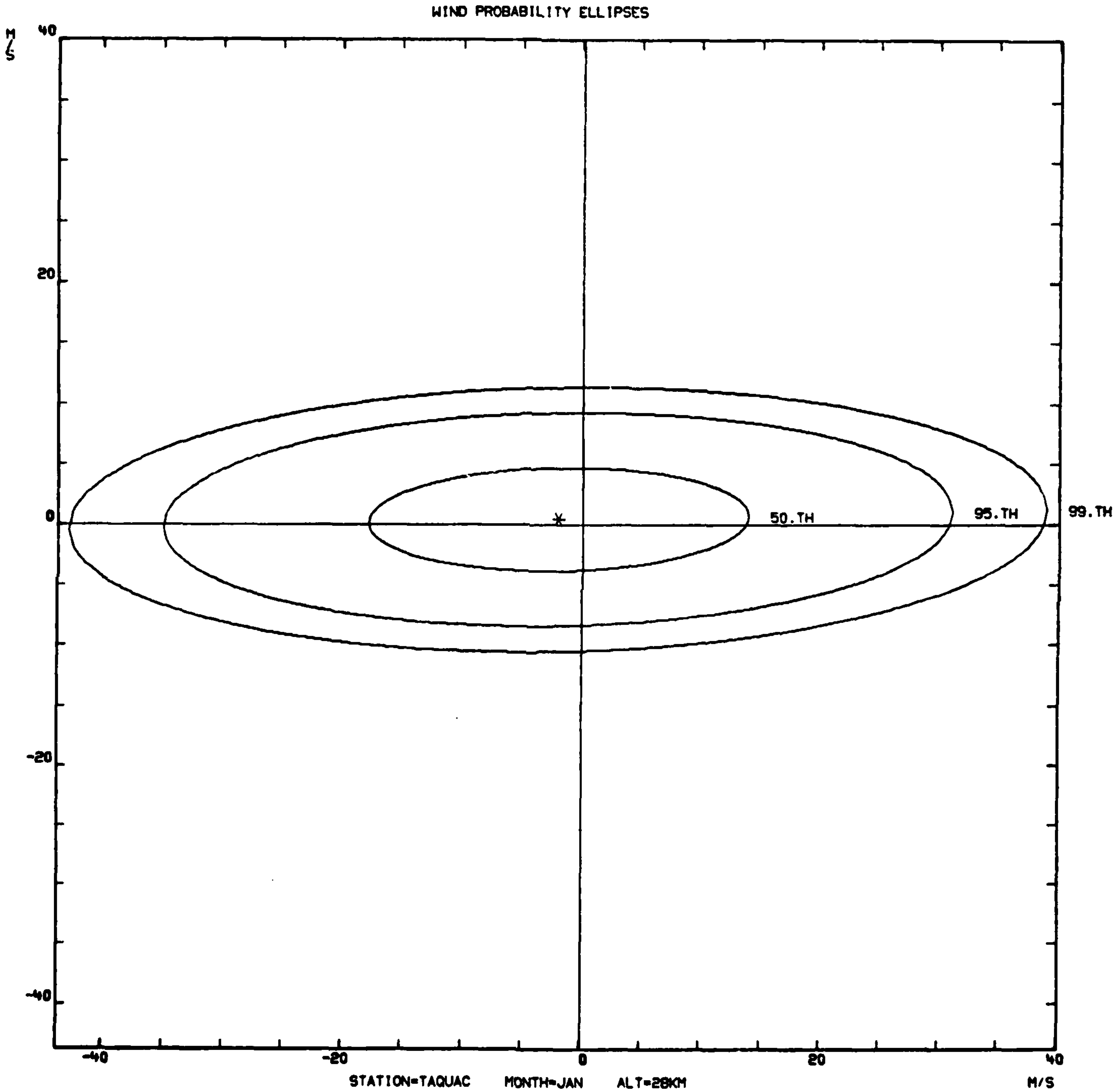

WIND PROBABILITY ELLIPSES
M/S
40
20
0
-20
-40
50.TH
95.TH
99.TH
-40
-20
0
20
40
STATION=TAQUAC MONTH=JAN ALT=28KM
M/S

Fig. A-44.

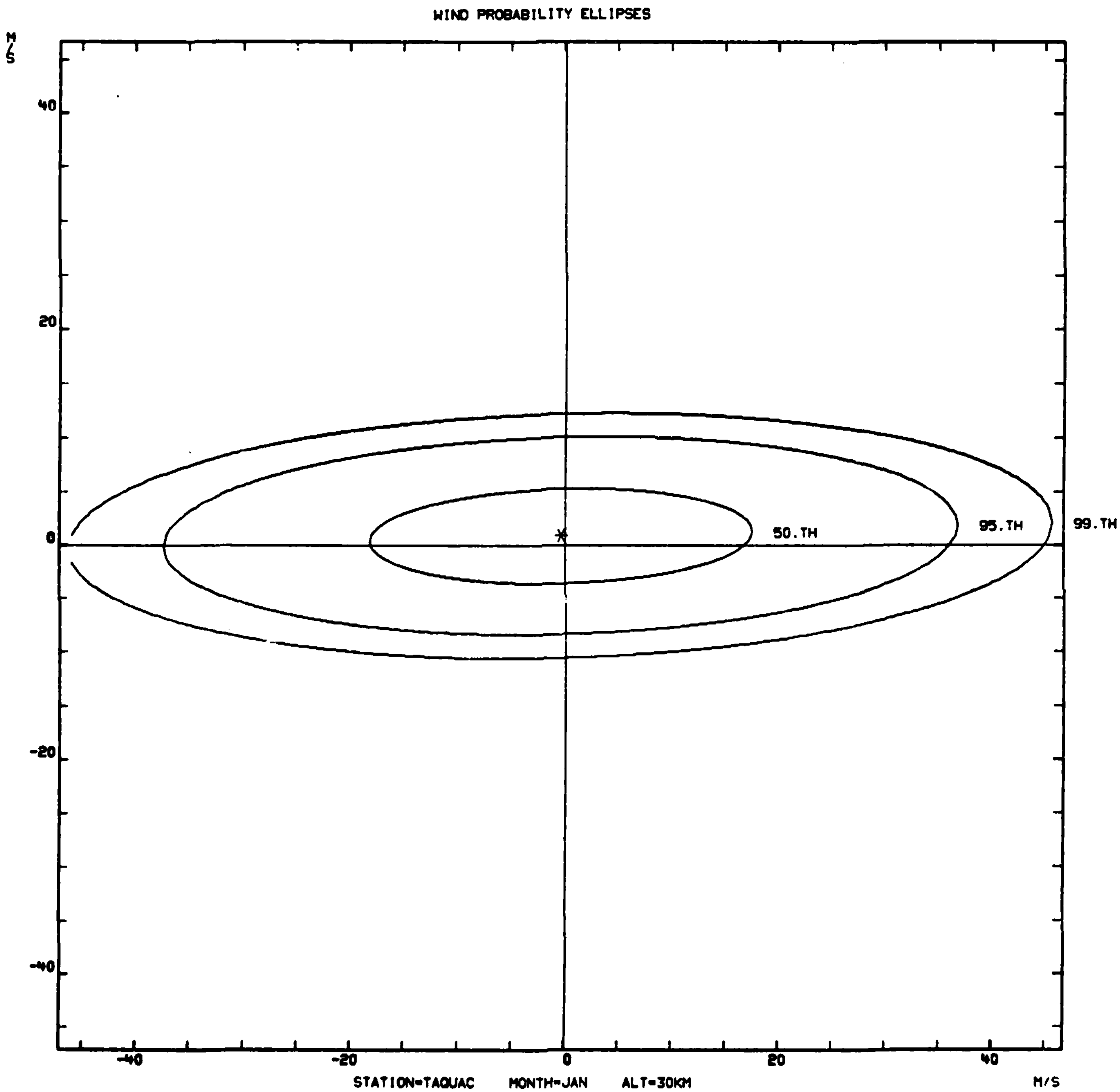
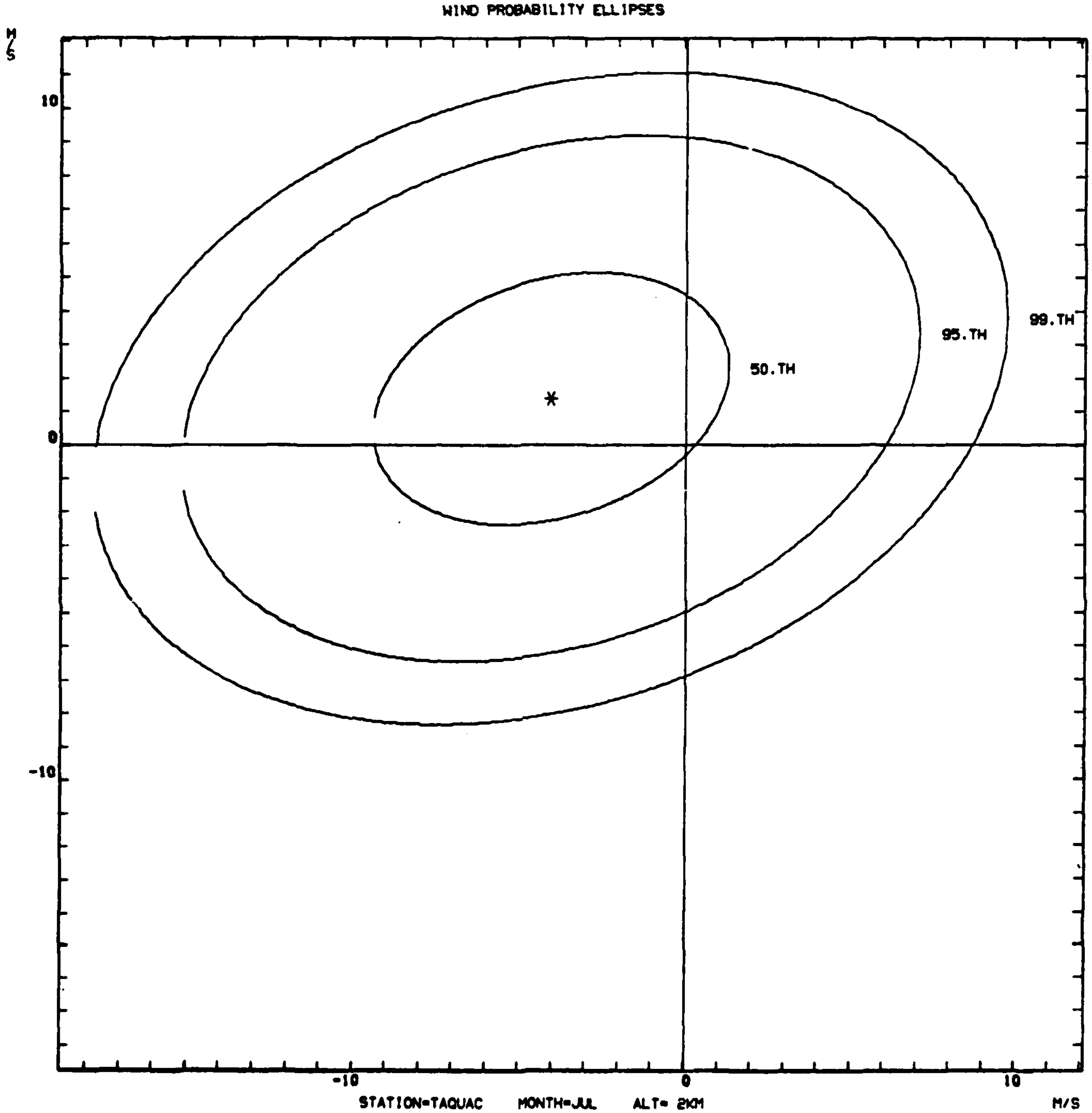

WIND PROBABILITY ELLIPSES
M/S
40
20
0
-20
-40
50.TH
95.TH
99.TH
-40
-20
0
20
40
STATION=TAQUAC MONTH=JAN ALT=30KM
M/S

Fig. A-45.



WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-10
0
10
M/S
50.TH
95.TH
99.TH
STATION=TAQUAC MONTH=JUL ALT= 2KM

Fig. A-46.

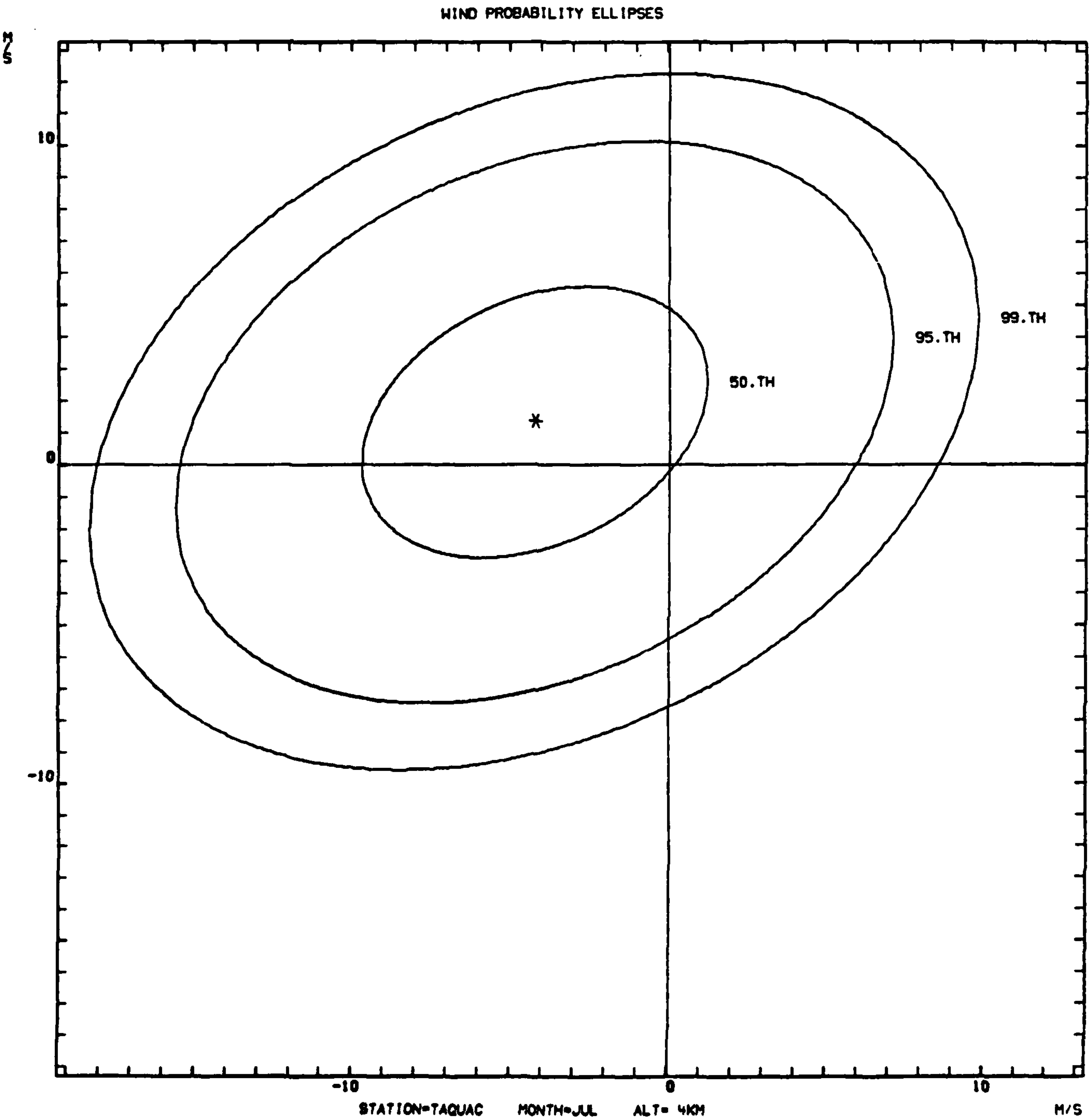

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
50.TH
95.TH
99.TH
-10
0
10
STATION=TAQUAC MONTH=JUL ALT= 4KM
M/S

Fig. A-47.

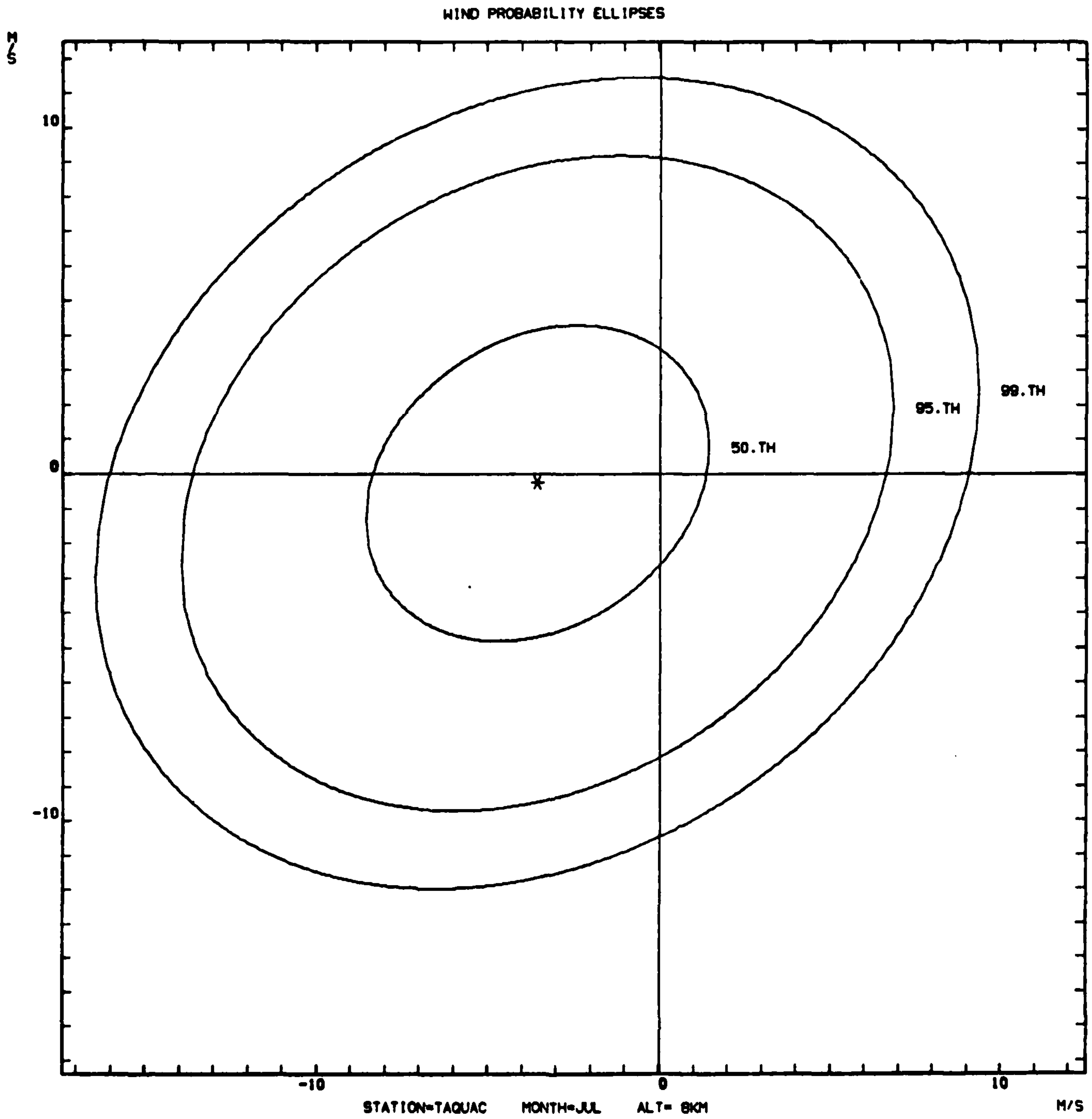

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-10
0
10
M/S
50.TH
95.TH
99.TH
STATION=TAQUAC MONTH=JUL ALT= 8KM

Fig. A-48.

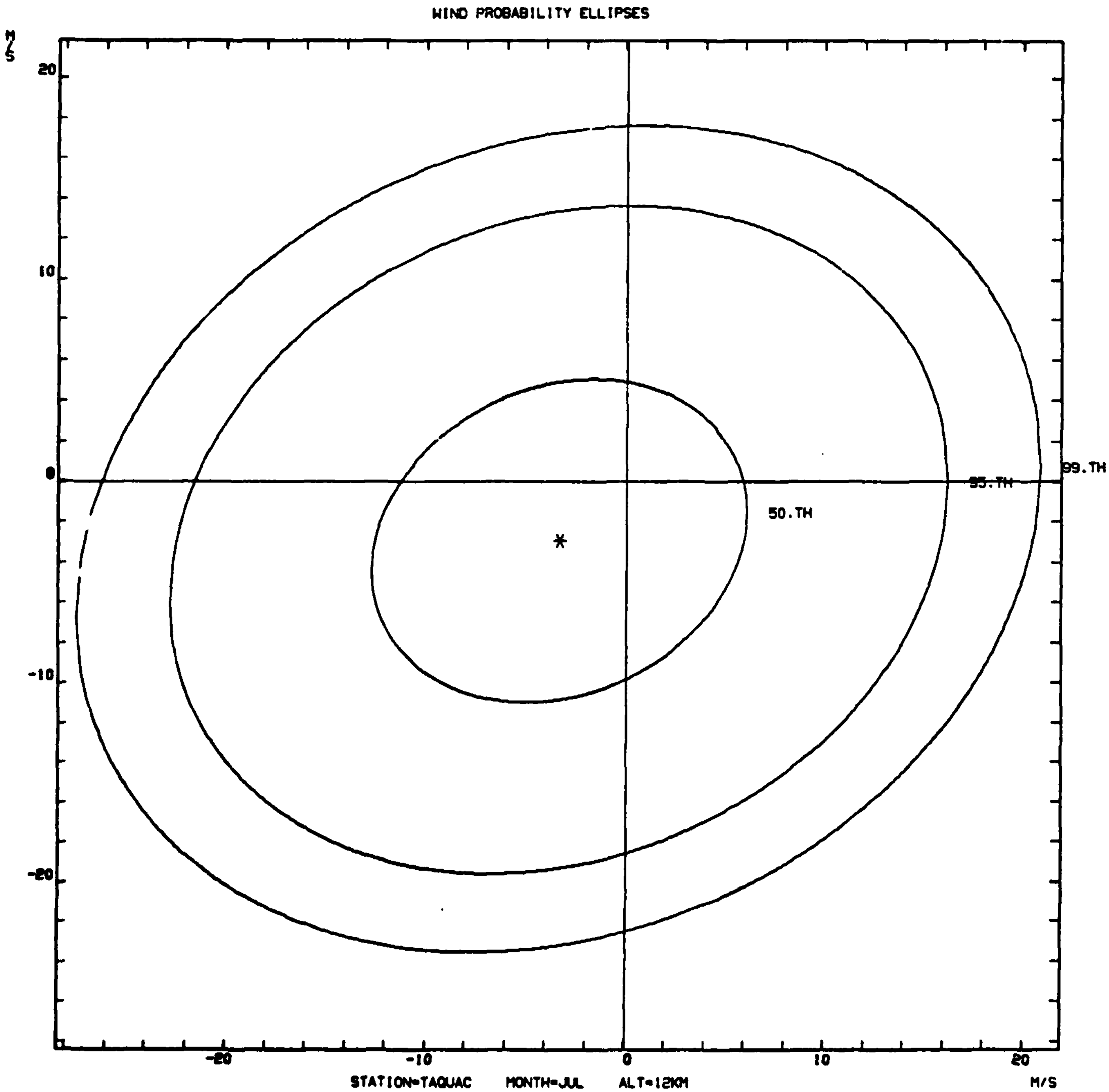
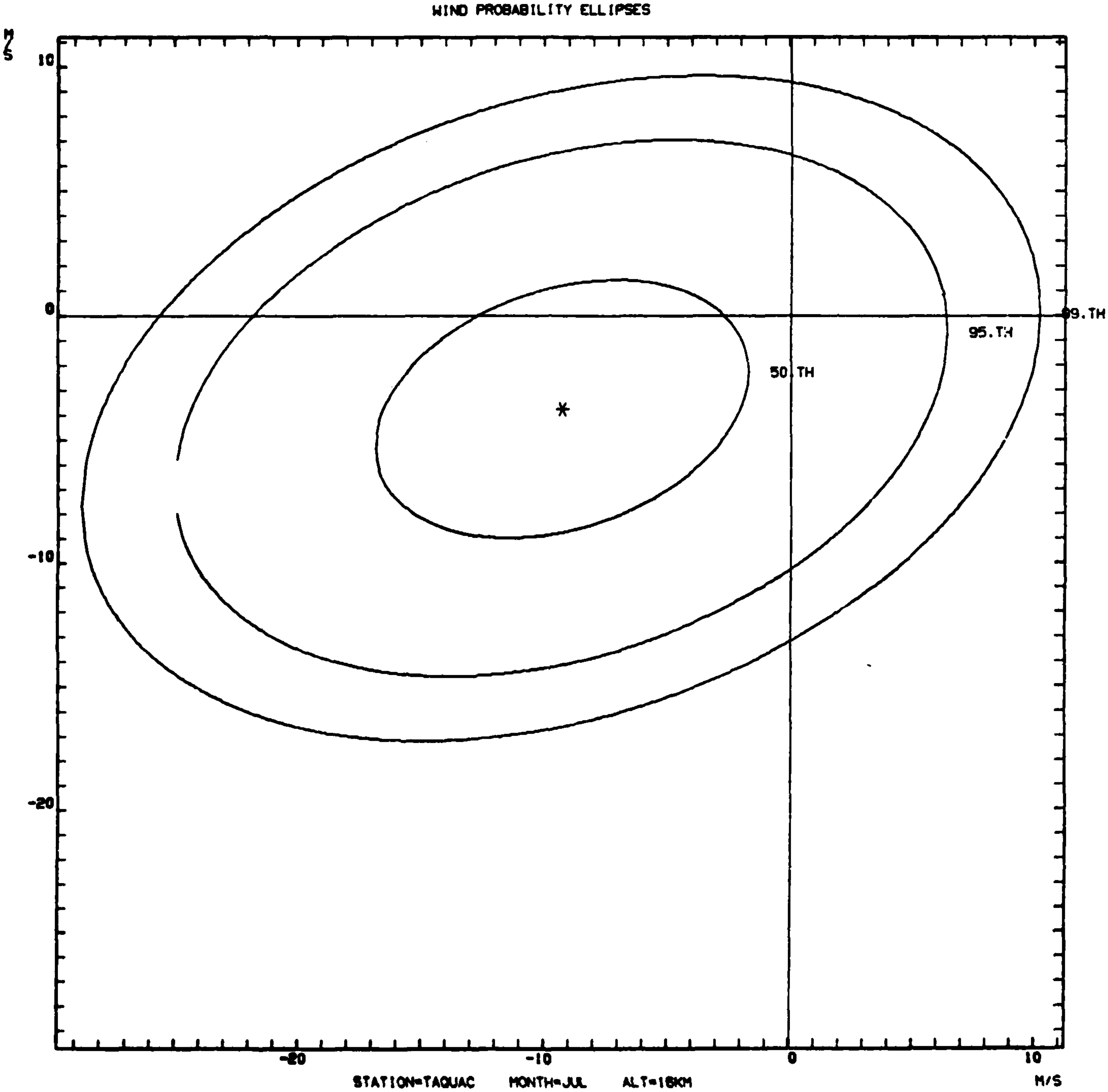

WIND PROBABILITY ELLIPSES
M/S
20
10
0
-10
-20
99.TH
95.TH
50.TH
-20
-10
0
10
20
STATION=TAQUAC MONTH=JUL ALT=12KM
M/S

Fig. A-49.



WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
-20
-10
0
10
M/S
50.TH
95.TH
99.TH
STATION=TAQUAC MONTH=JUL ALT=18KM

Fig. A-50.

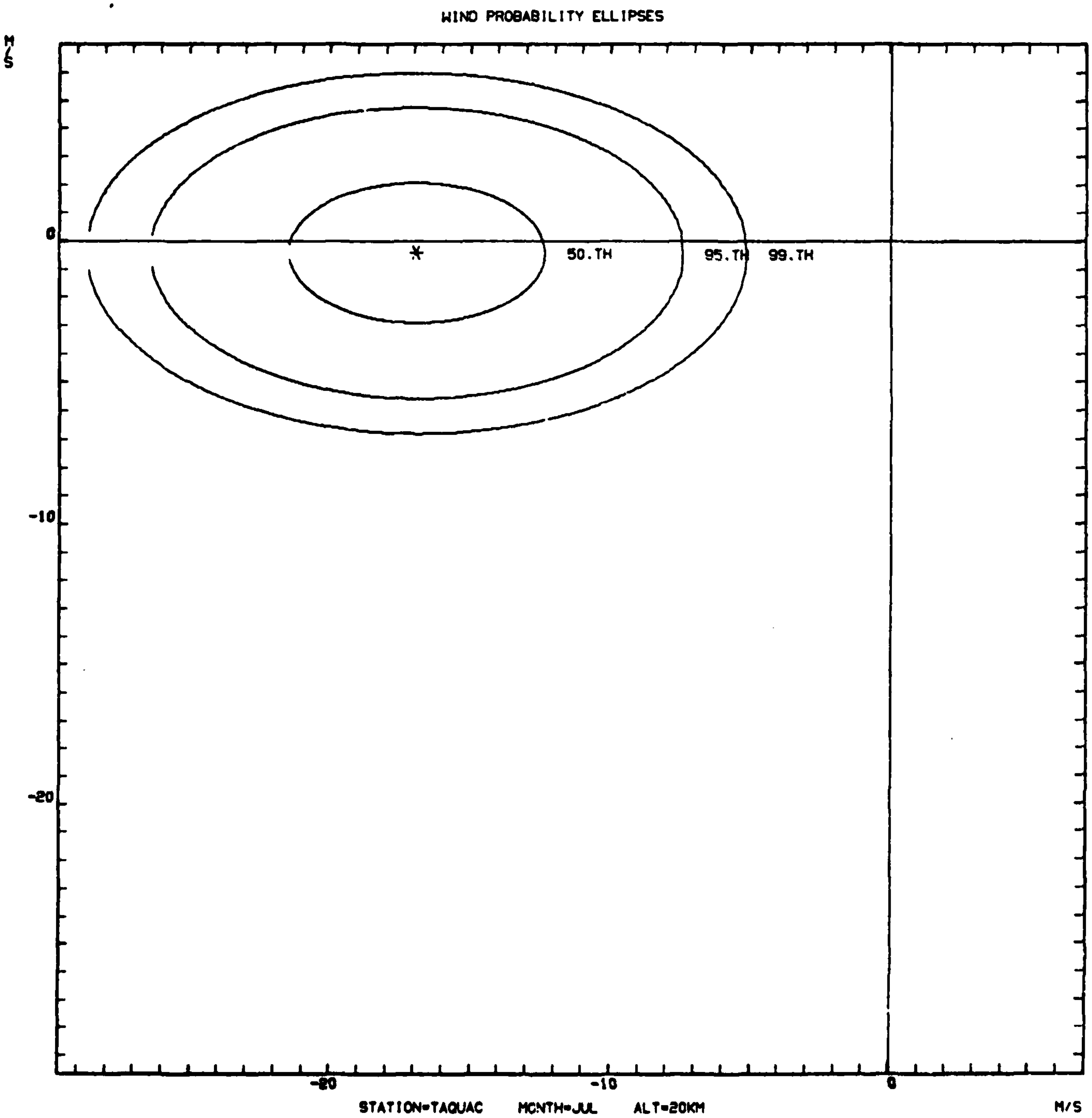

WIND PROBABILITY ELLIPSES
M/S
0
-10
-20
50.TH
95.TH
99.TH
-20
-10
0
M/S
STATION=TAQUAC MONTH=JUL ALT=20KM

Fig. A-51.

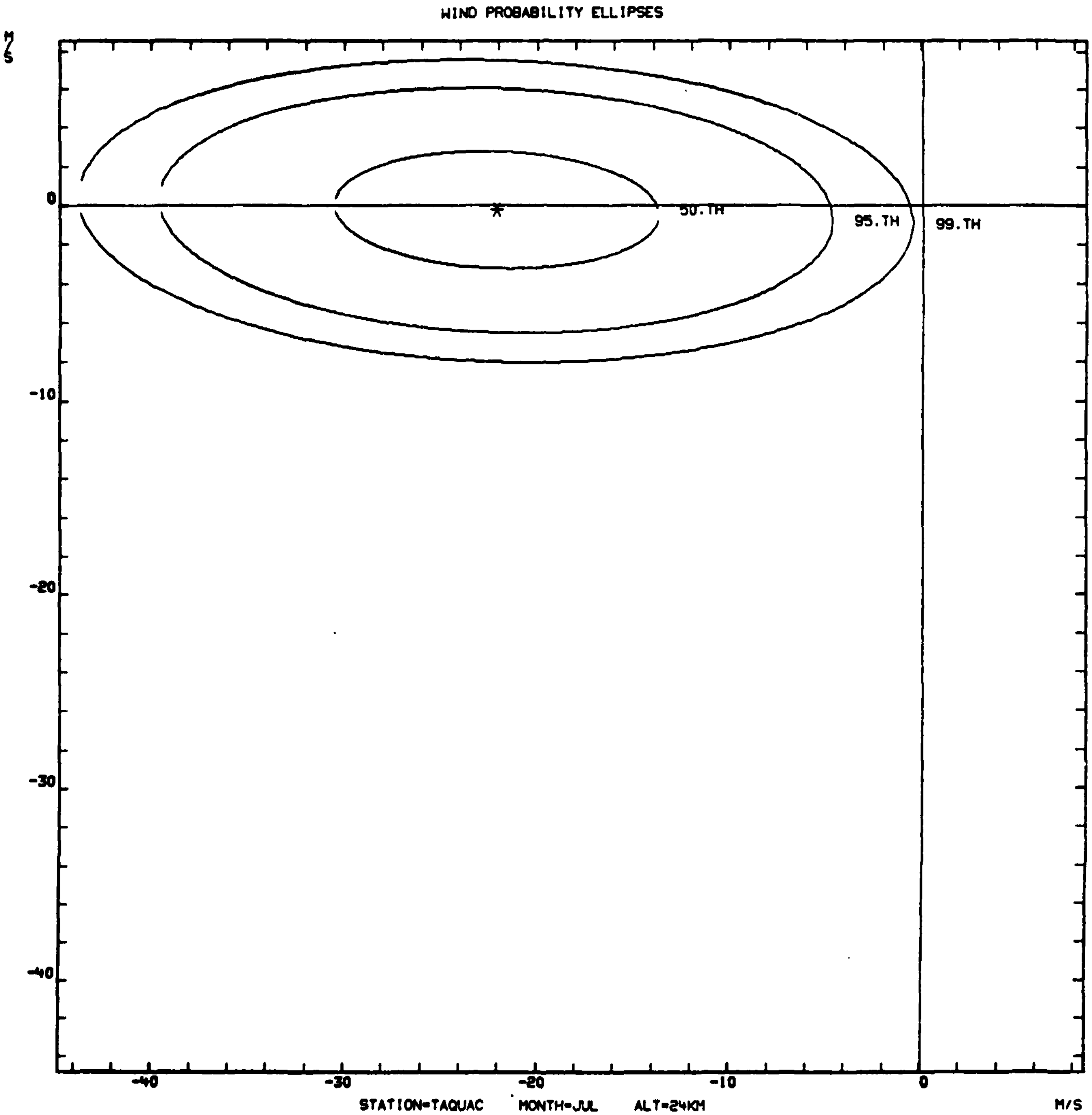
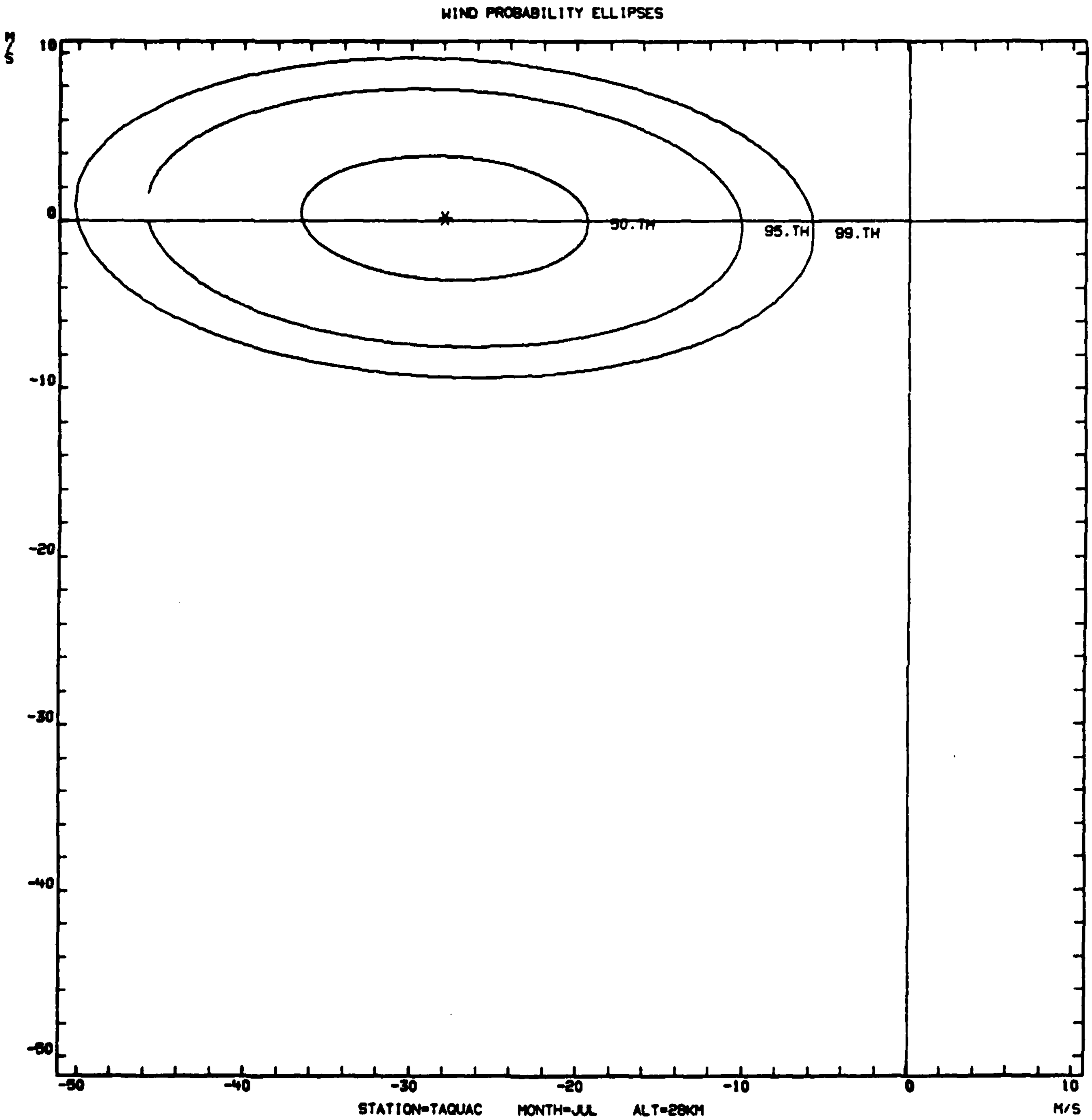

WIND PROBABILITY ELLIPSES
M/S
0
-10
-20
-30
-40
50.TH
95.TH
99.TH
-40
-30
-20
-10
0
STATION=TAQUAC MONTH=JUL ALT=24KM
M/S

Fig. A-52.



WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
-30
-40
-50
50.TH
95.TH
99.TH
-50
-40
-30
-20
-10
0
10
STATION=TAQUAC MONTH=JUL ALT=28KM
M/S

Fig. A-53.

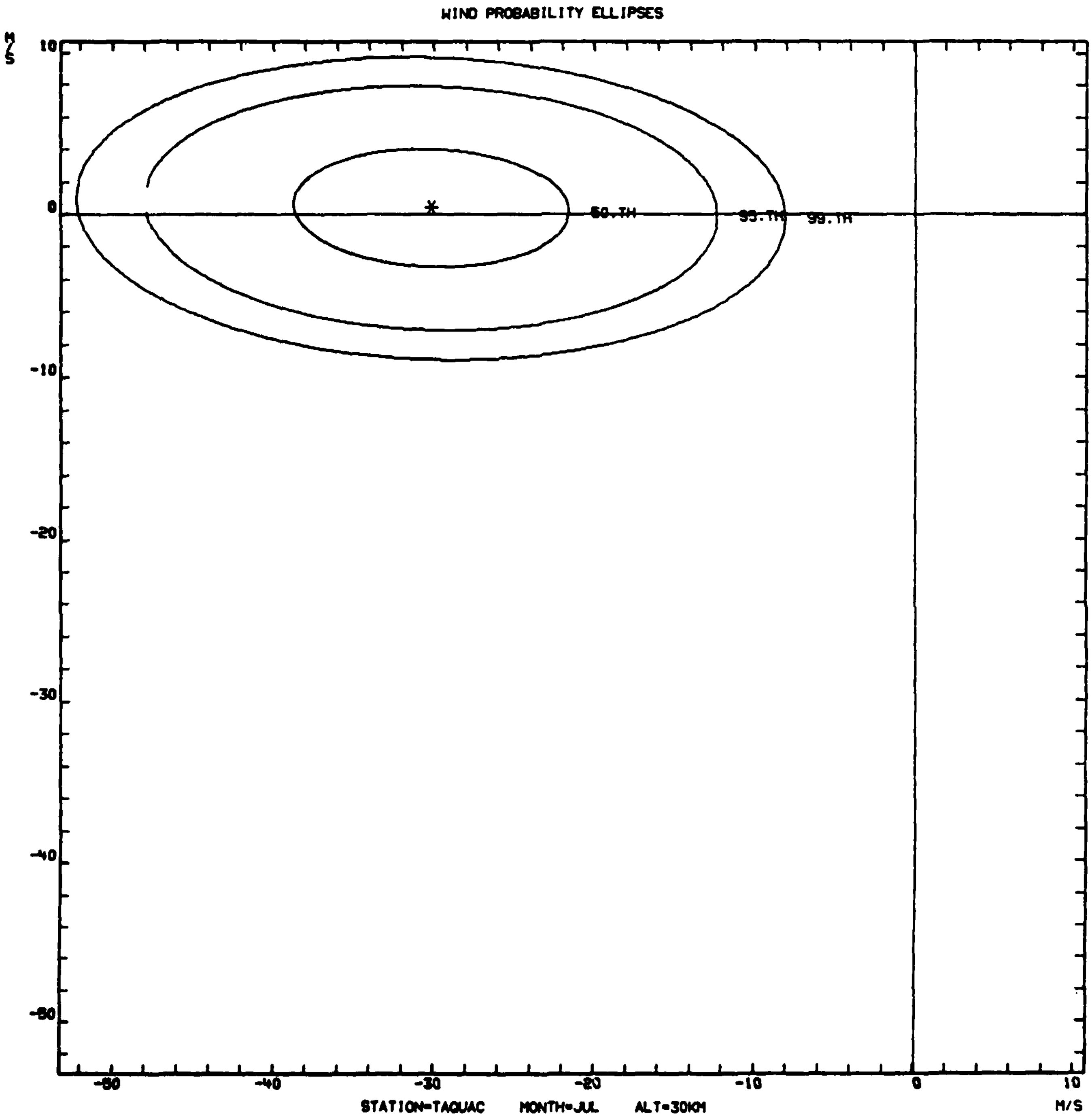
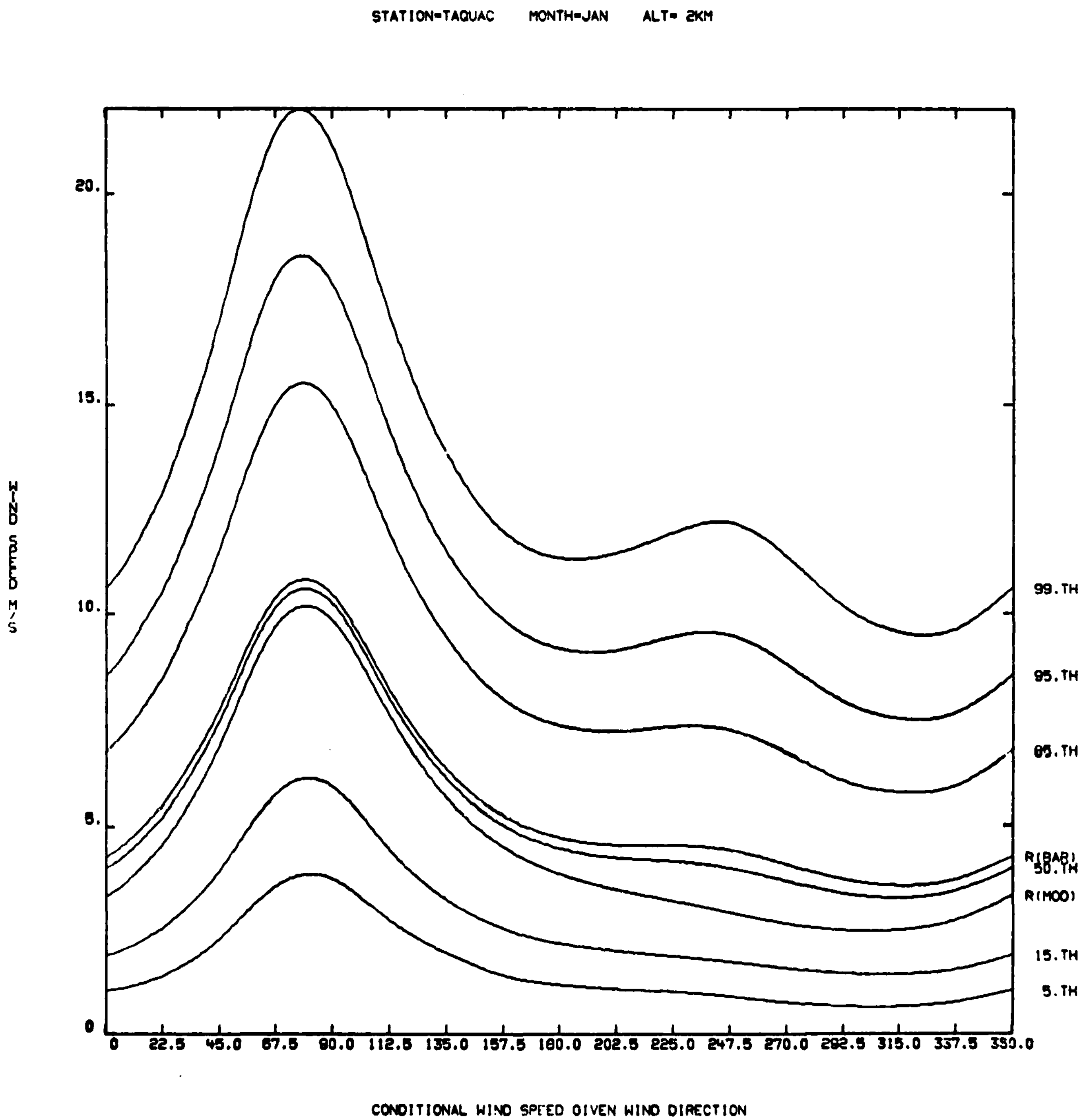

WIND PROBABILITY ELLIPSES
M/S
10
0
-10
-20
-30
-40
-50
50.TH
95.TH
99.TH
-50
-40
-30
-20
-10
0
10
M/S
STATION=TAQUAC MONTH=JUL ALT=30KM

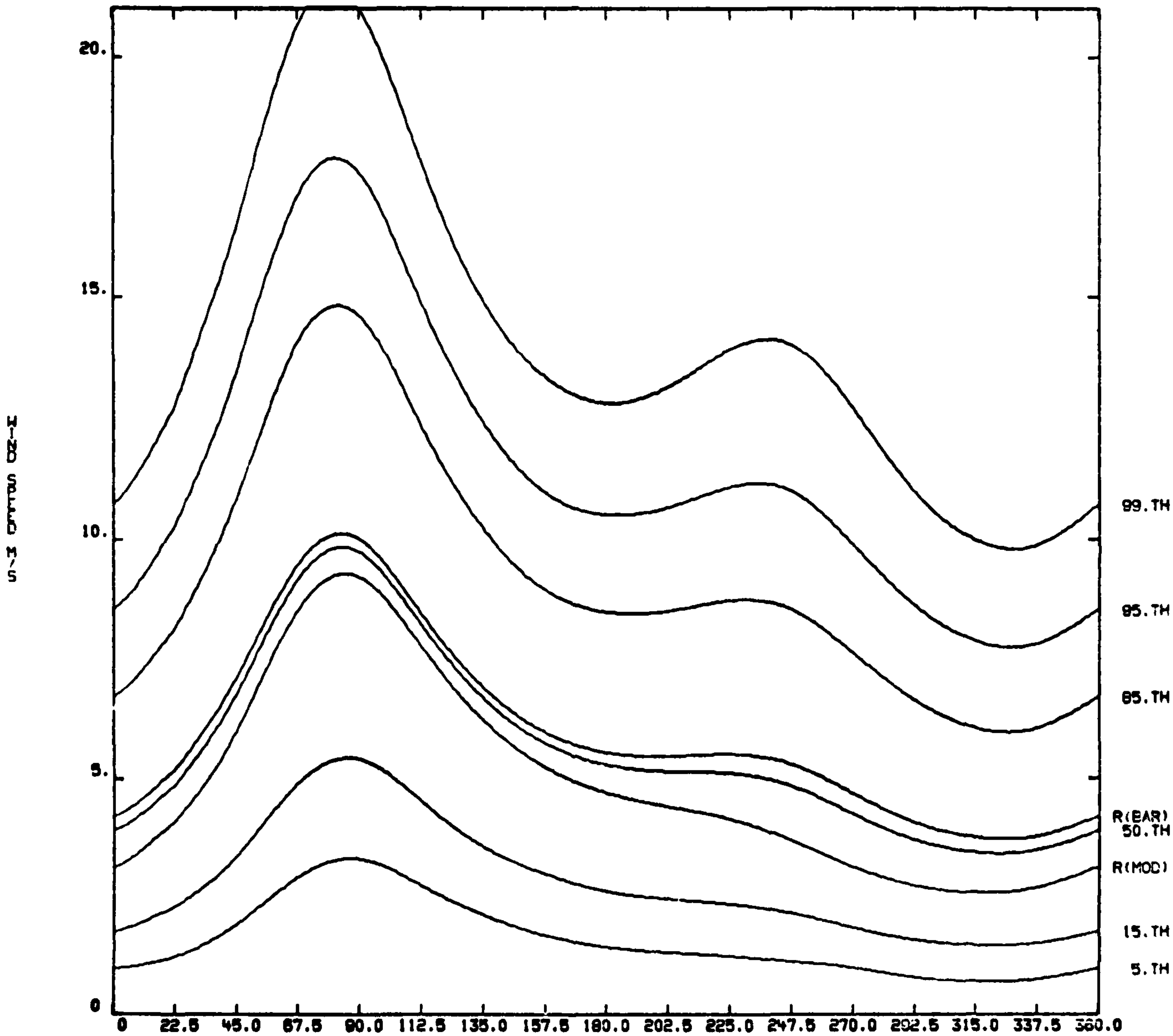
Fig. A-54.



STATION=TAQUAC MONTH=JAN ALT= 2KM
WIND SPEED M/S
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-55.

STATION=TAQUAC MONTH=JAN ALT= 4KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-56.

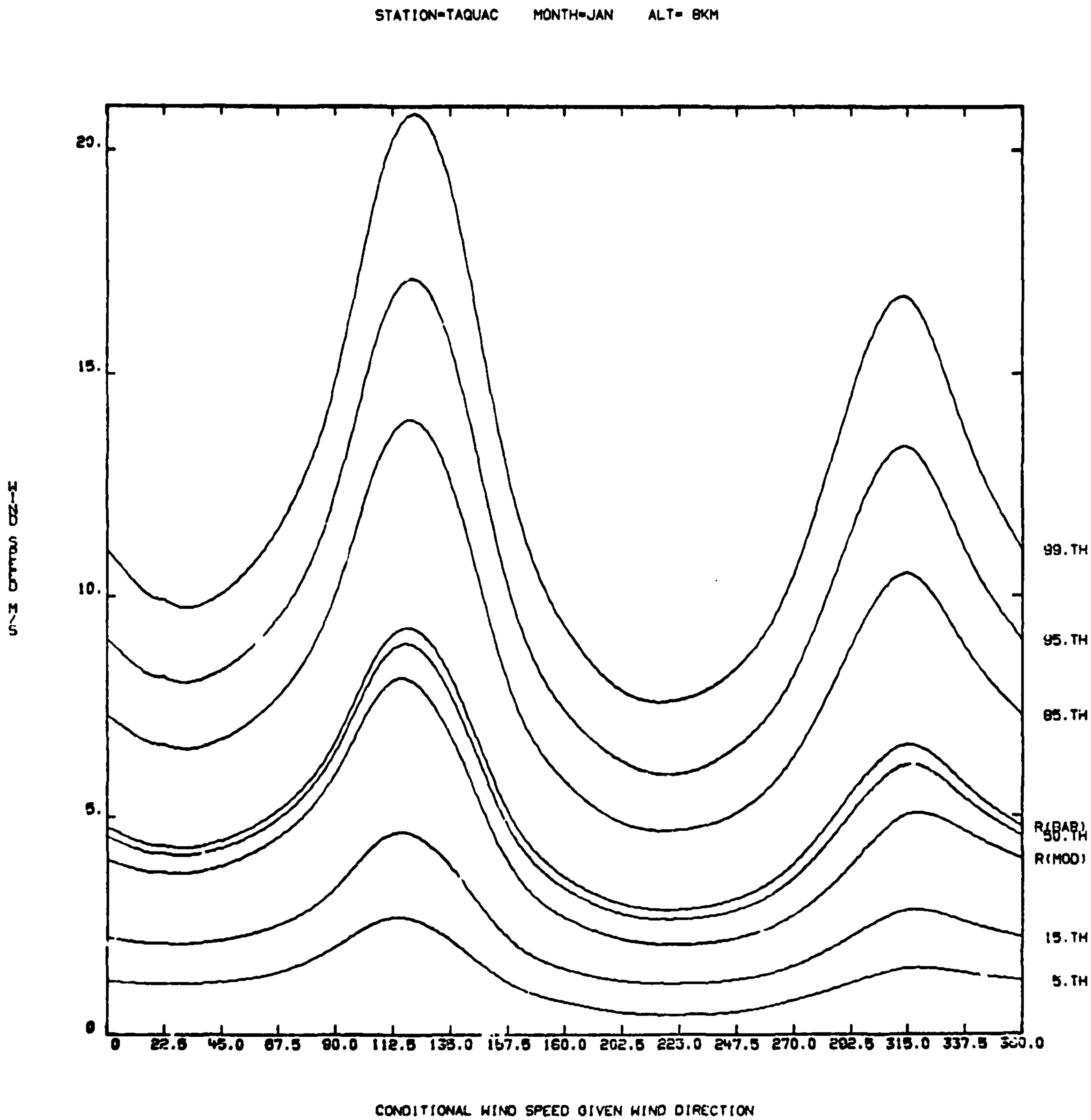

STATION=TAQUAC MONTH=JAN ALT= 8KM
WIND SPEED M/S
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-57.

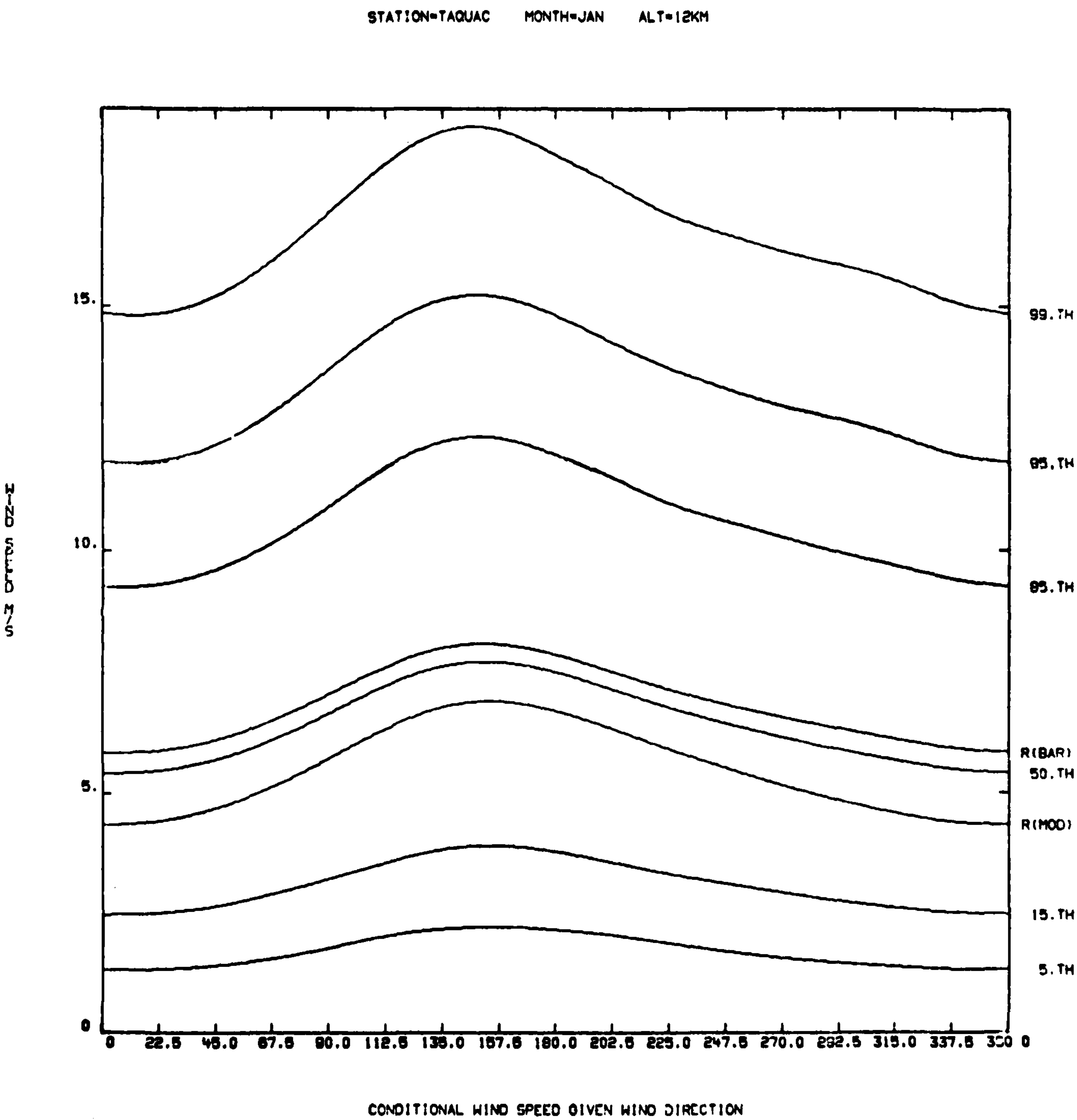

STATION=TAQUAC MONTH=JAN ALT=12KM
WIND SPEED M/S
15.
10.
5.
0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360
0
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-58.

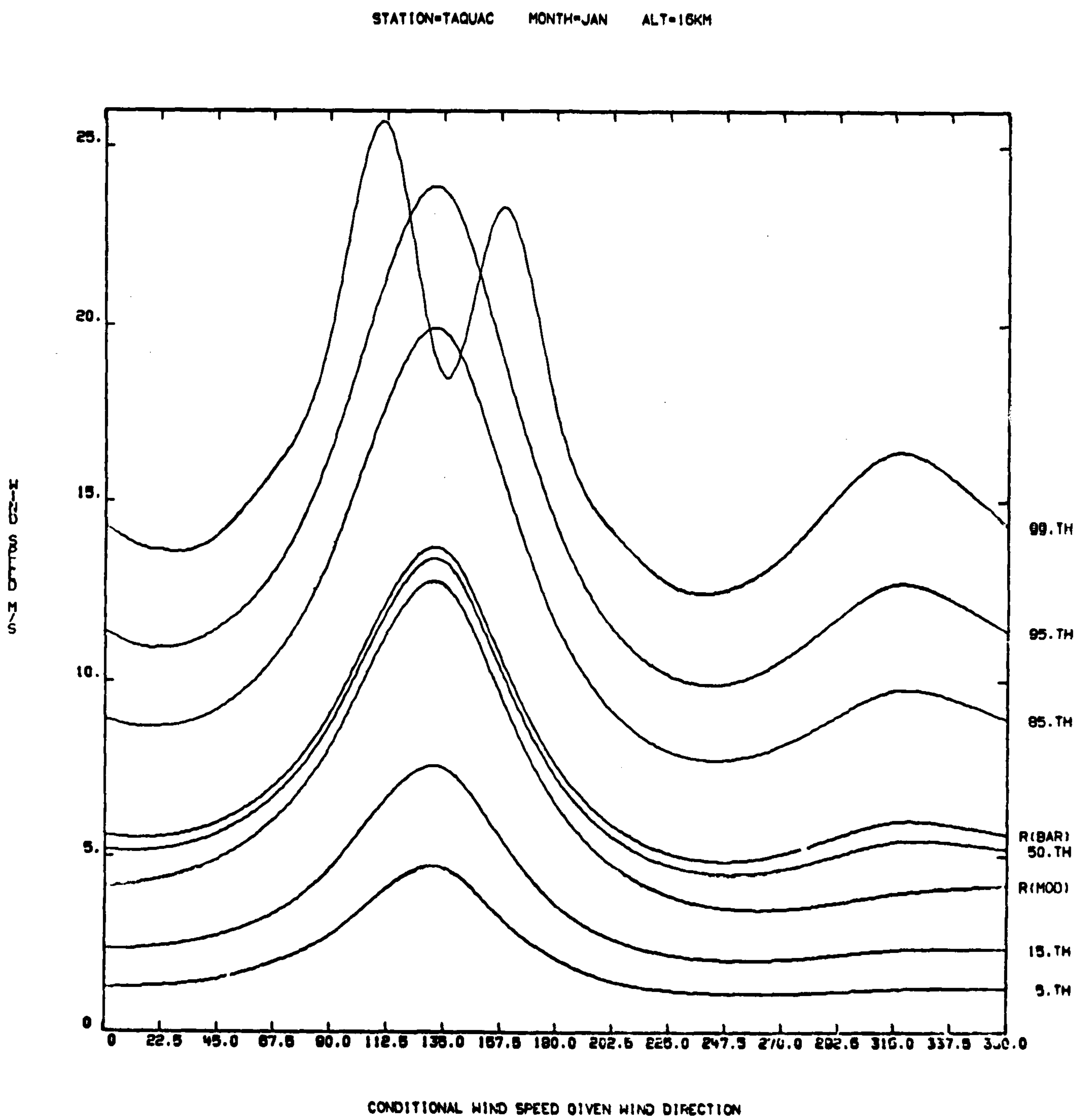

STATION=TAQUAC MONTH=JAN ALT=16KM
WIND SPEED M/S
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-59.

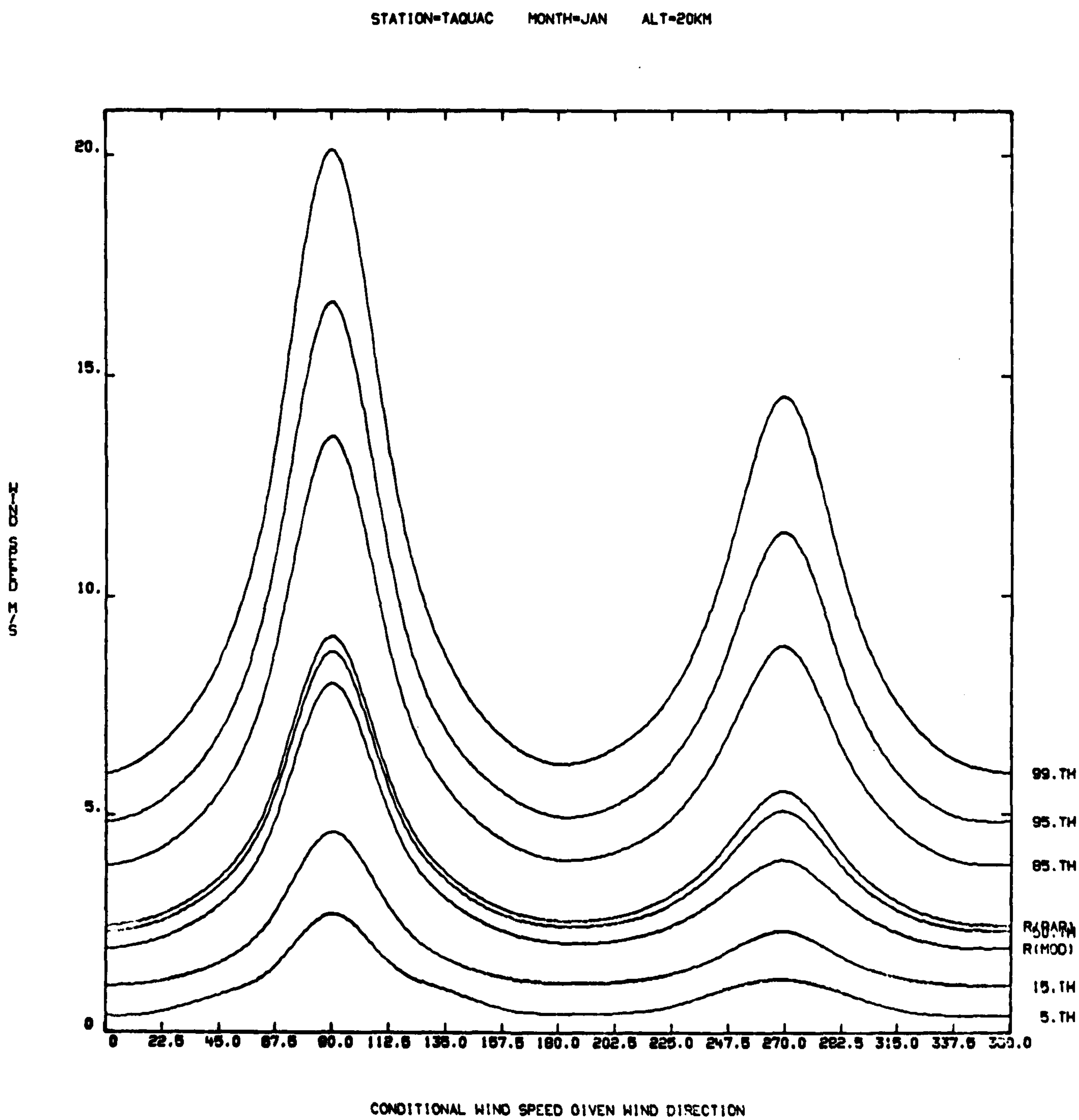
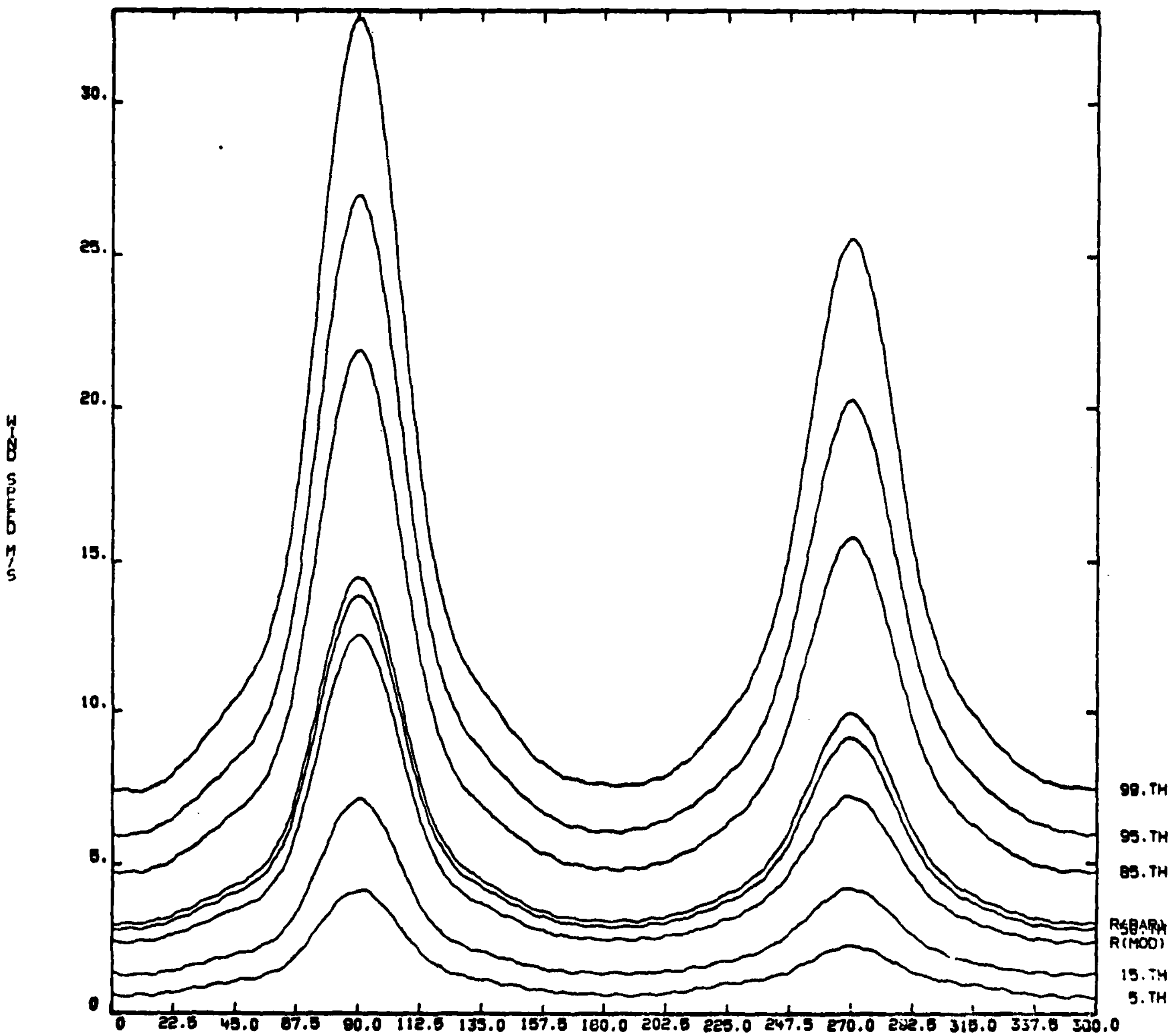

STATION=TAQUAC MONTH=JAN ALT=20KM
WIND SPEED M/S
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

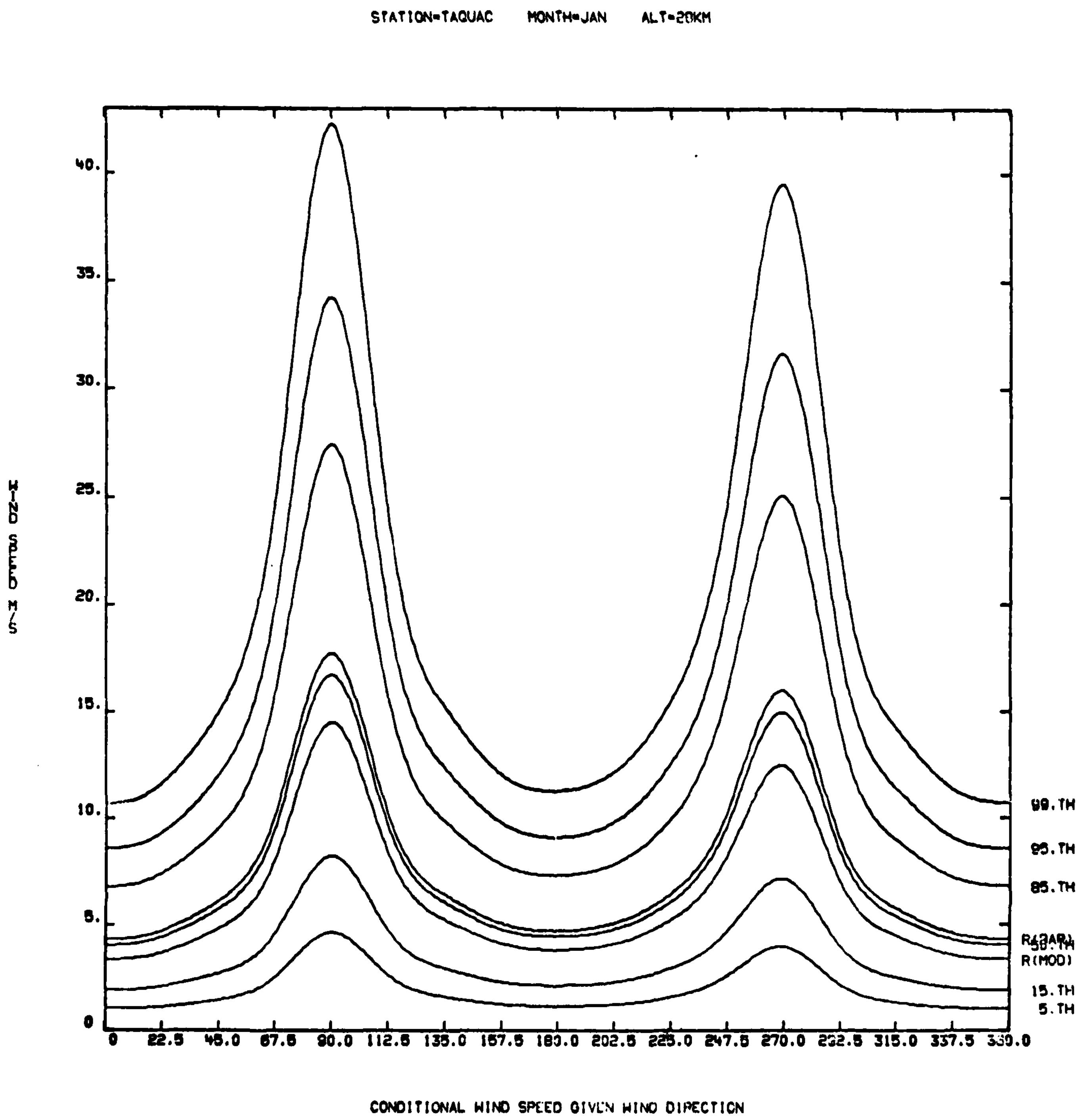
Fig. A-60.

STATION=TAQUAC MONTH=JAN ALT=24KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-61.



STATION=TAQUAC MONTH=JAN ALT=20KM
WIND SPEED M/S
40.
35.
30.
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(PAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-62.

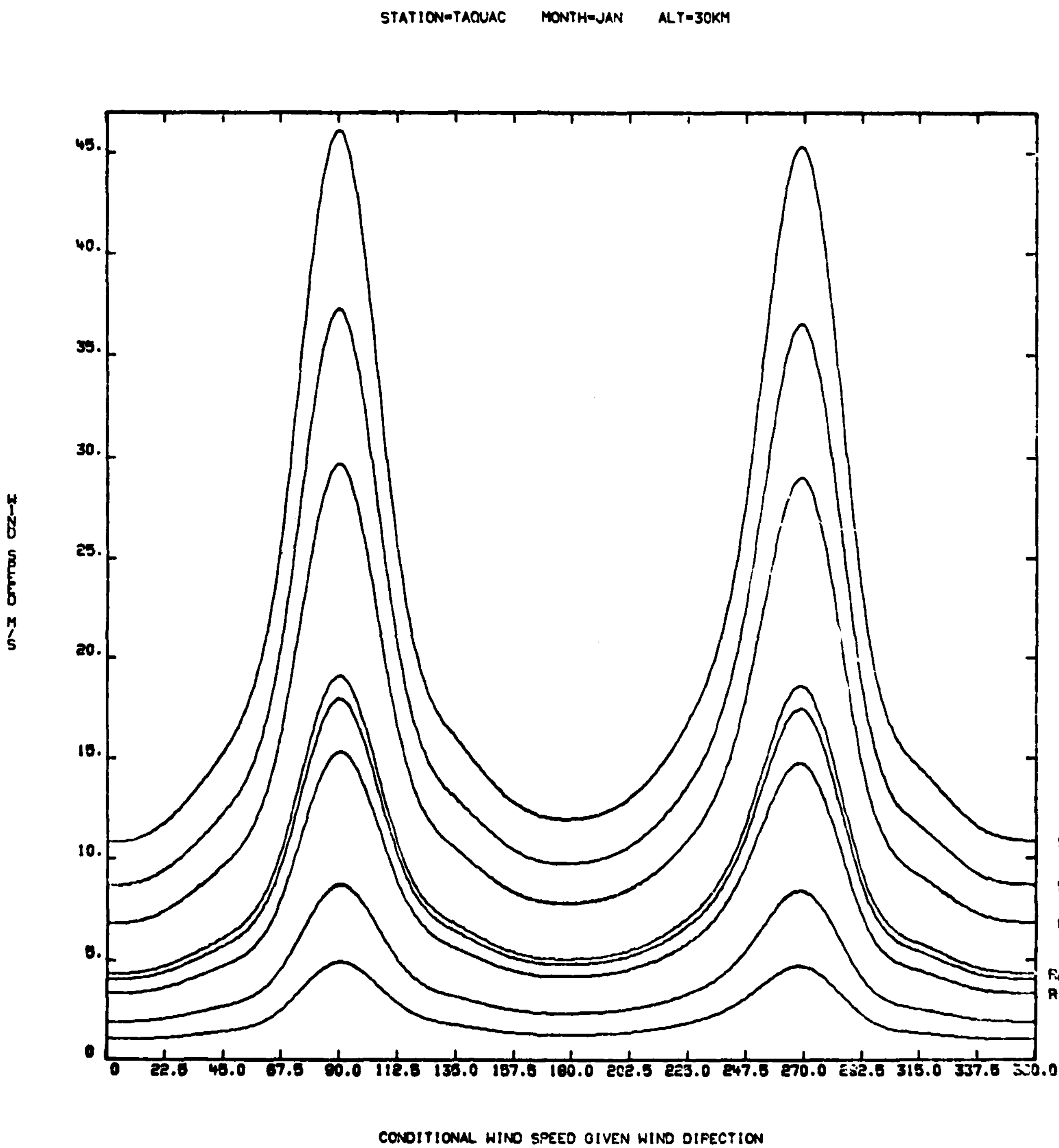
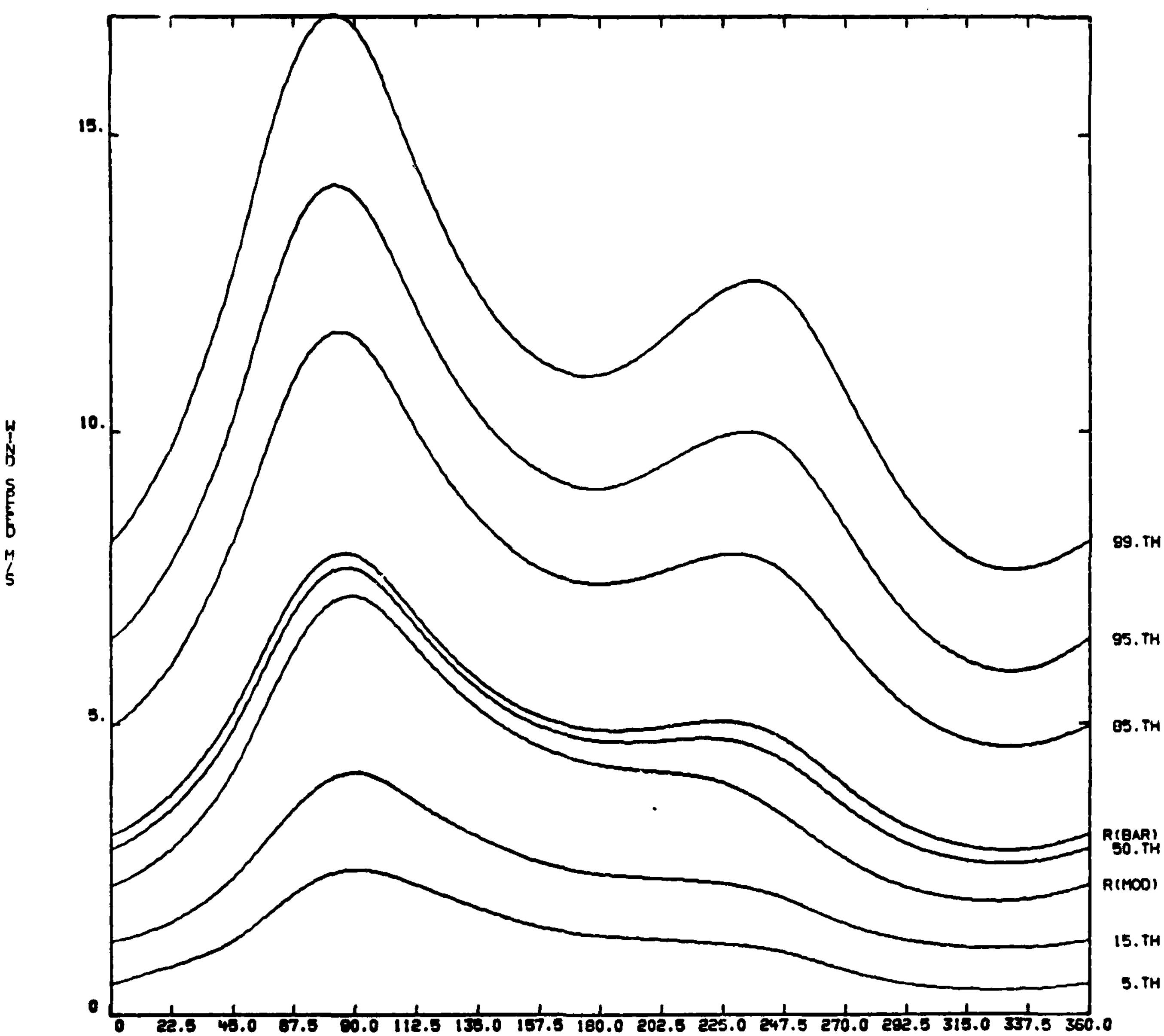

STATION=TAQUAC MONTH=JAN ALT=30KM
WIND SPEED M/S
0
5.
10.
15.
20.
25.
30.
35.
40.
45.
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
90.TH
95.TH
85.TH
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-63.

STATION=TAQUAC MONTH=JUL ALT= 2KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-64.

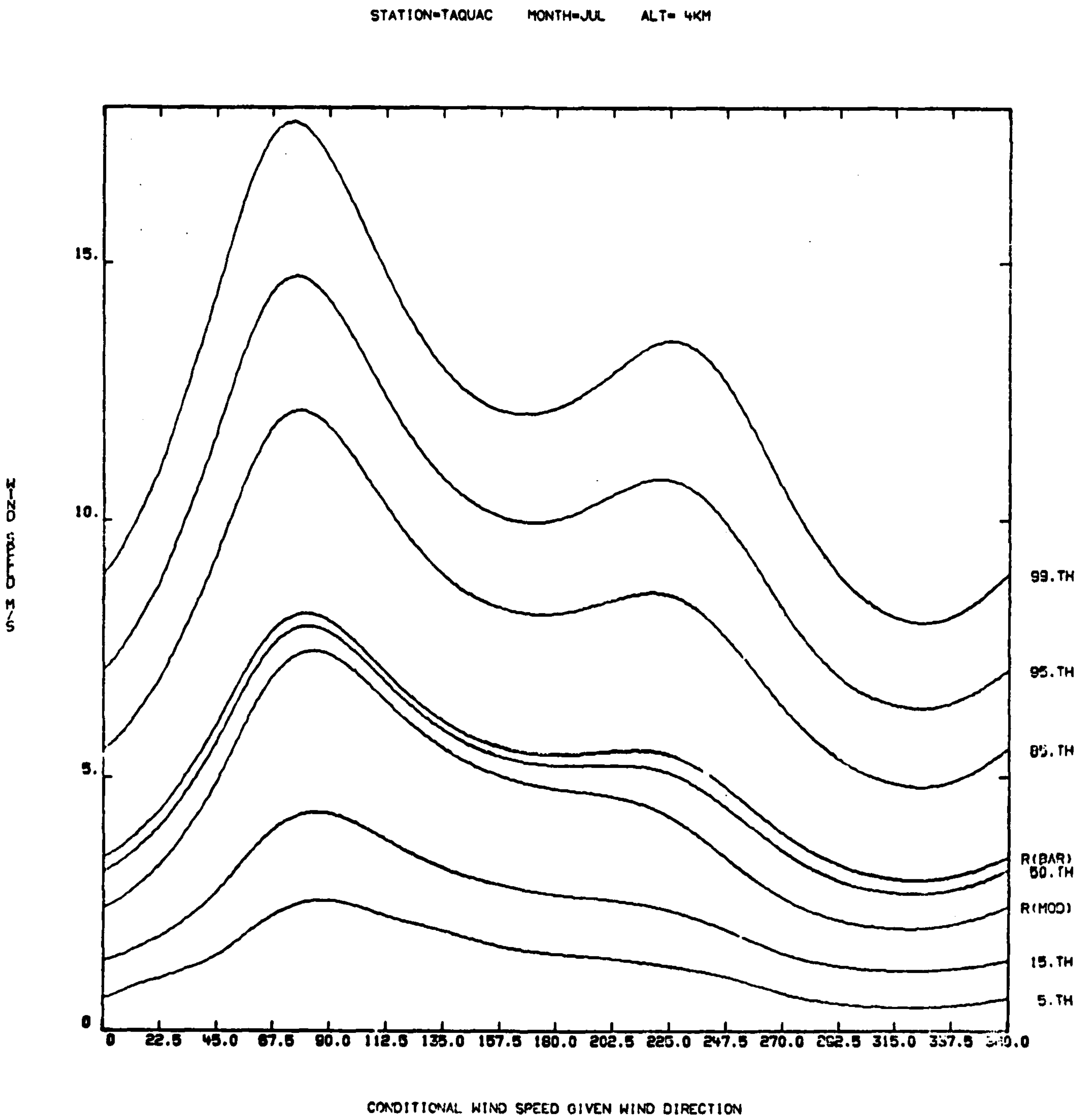
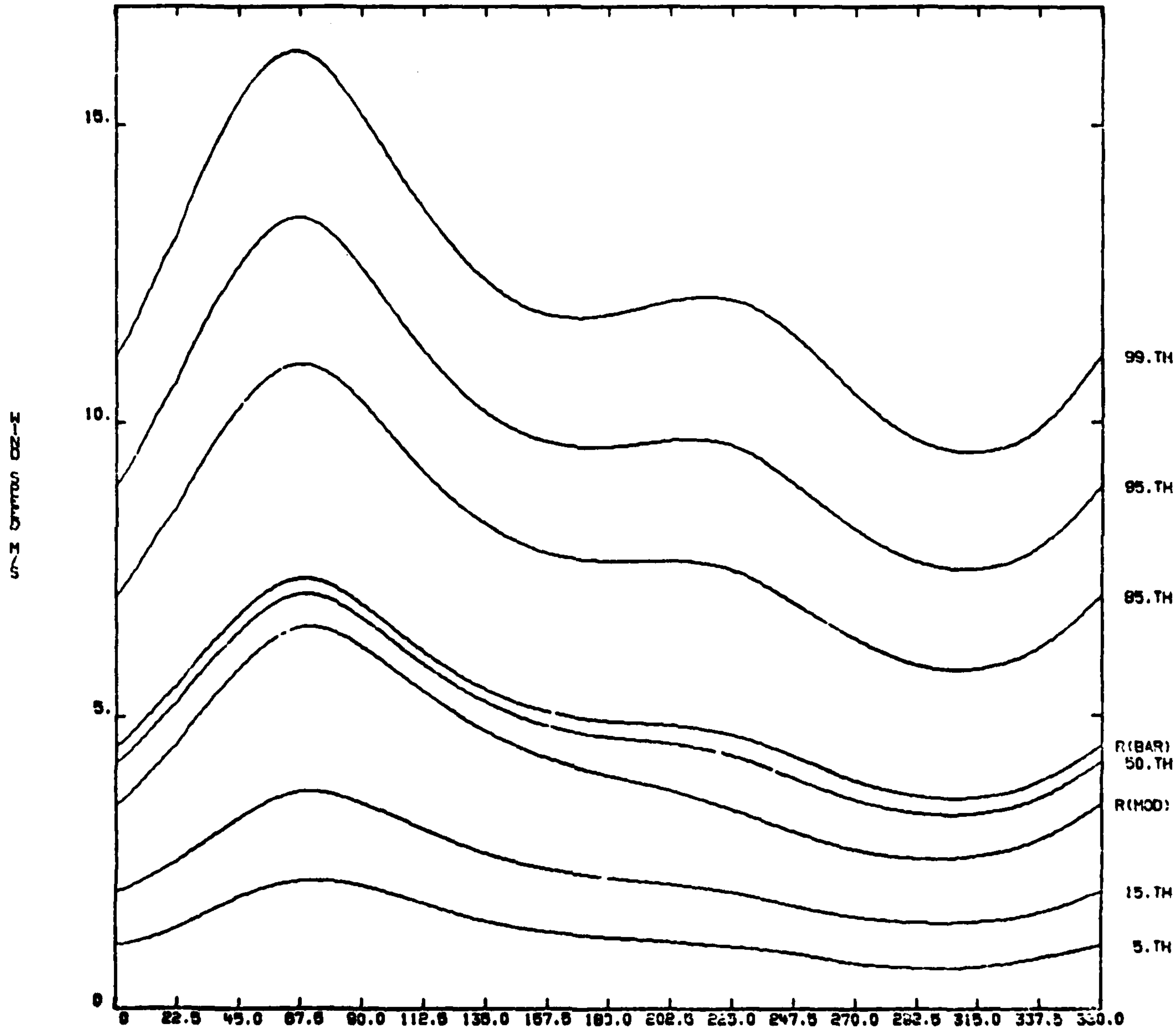

STATION=TAQUAC MONTH=JUL ALT= 4KM
WIND SPEED M/S
15.
10.
5.
0
0
22.5
45.0
67.5
90.0
112.5
135.0
157.5
180.0
202.5
225.0
247.5
270.0
292.5
315.0
337.5
360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

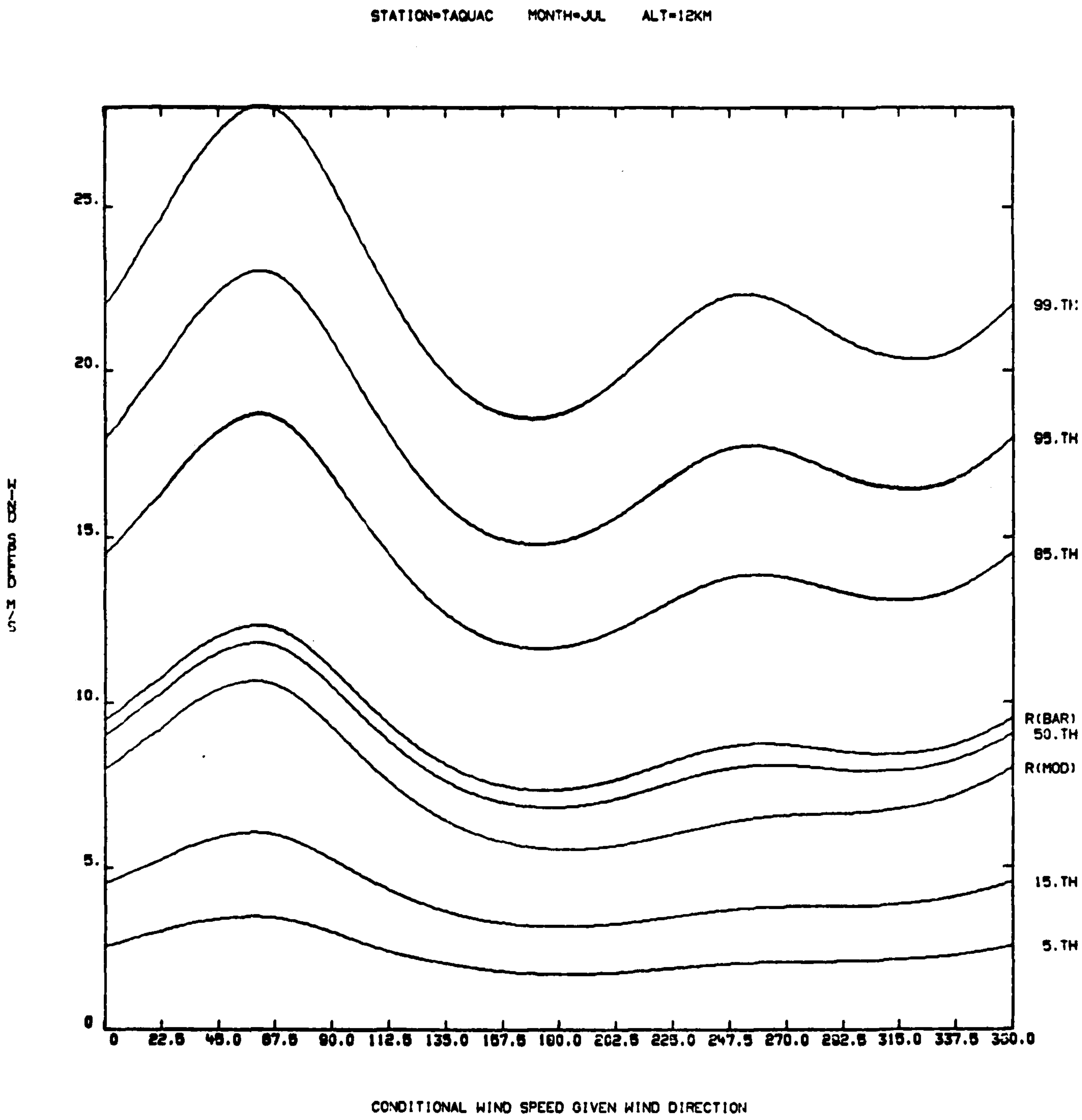
Fig. A-65.

STATION=TAQUAC MONTH=JUL ALT= 8KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

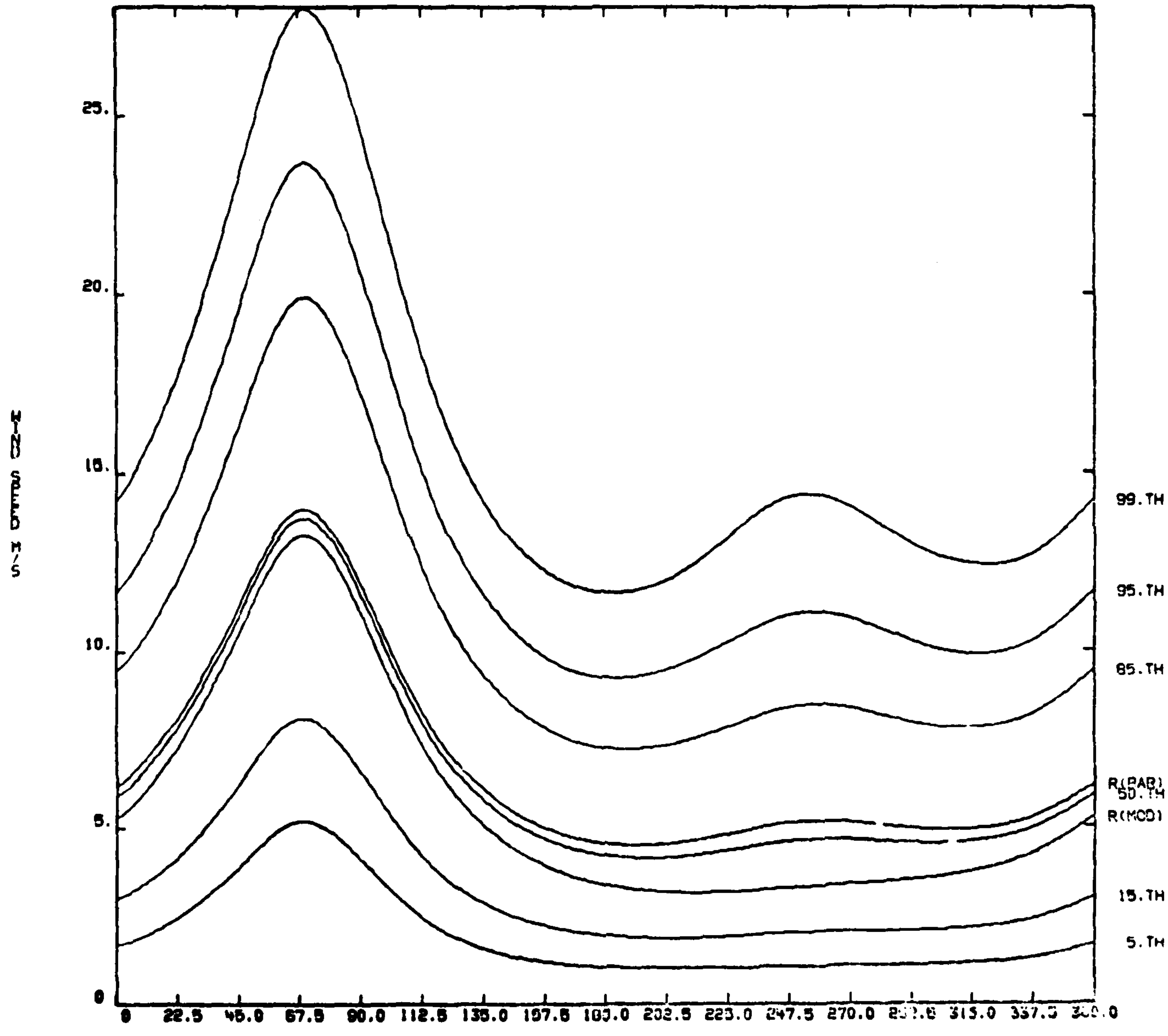
Fig. A-66.



STATION=TAQUAC MONTH=JUL ALT=12KM
WIND SPEED M/S
25.
20.
15.
10.
5.
0
0 22.5 45.0 67.5 90.0 112.5 135.0 157.5 180.0 202.5 225.0 247.5 270.0 292.5 315.0 337.5 360.0
99.TH
95.TH
85.TH
R(BAR)
50.TH
R(MOD)
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-67.

STATION=TAQUAC MONTH=JUL ALT=18KM



CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-68.

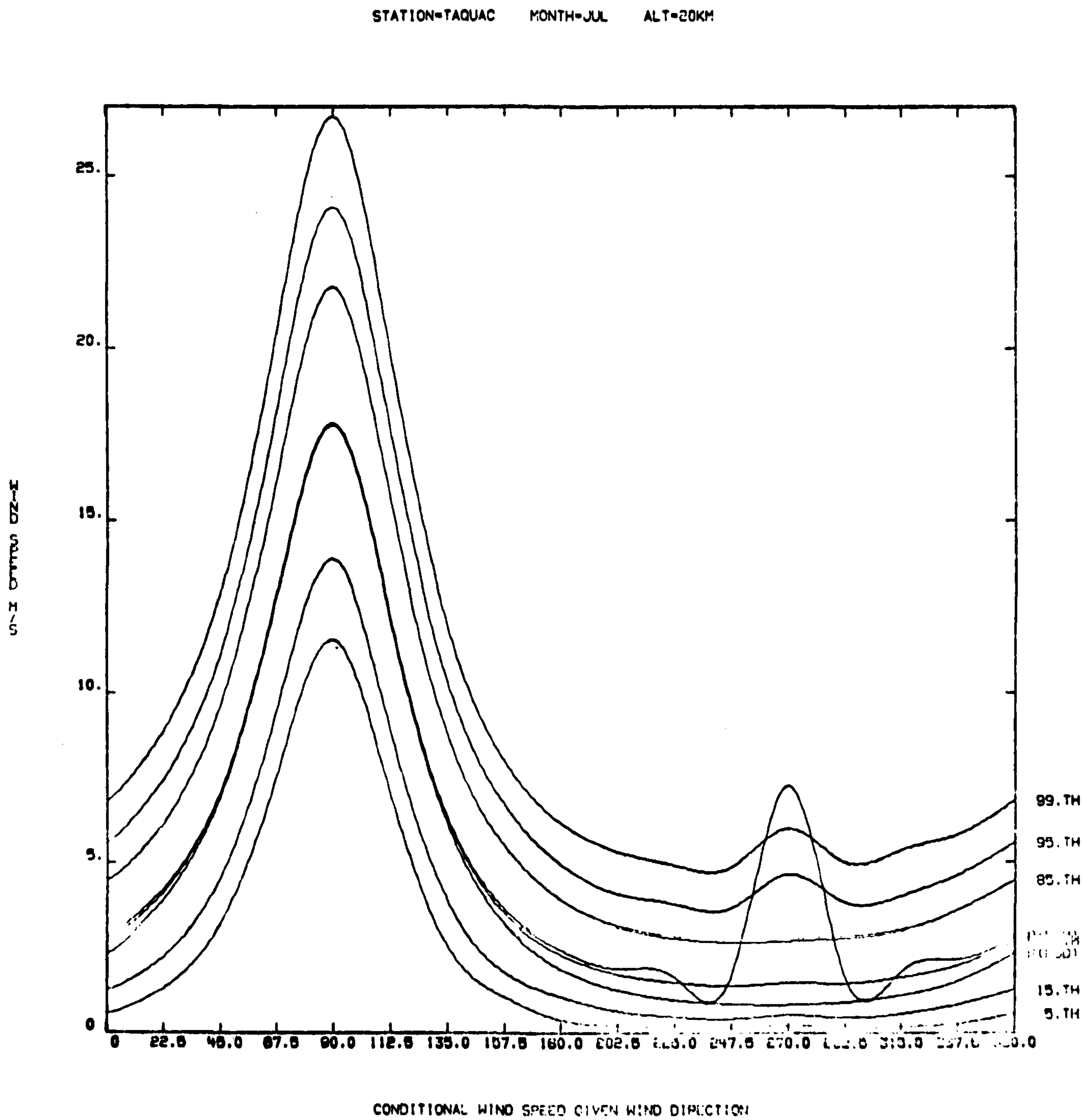

STATION=TAQUAC MONTH=JUL ALT=20KM
WIND SPEED M/S
25.
20.
15.
10.
5.
0
0
22.5
45.0
67.5
90.0
112.5
135.0
247.5
270.0
99.TH
95.TH
85.TH
15.TH
5.TH
CONDITIONAL WIND SPEED GIVEN WIND DIRECTION

Fig. A-69.

STATION=TAQUAC MONTH=JUL ALT=24KM

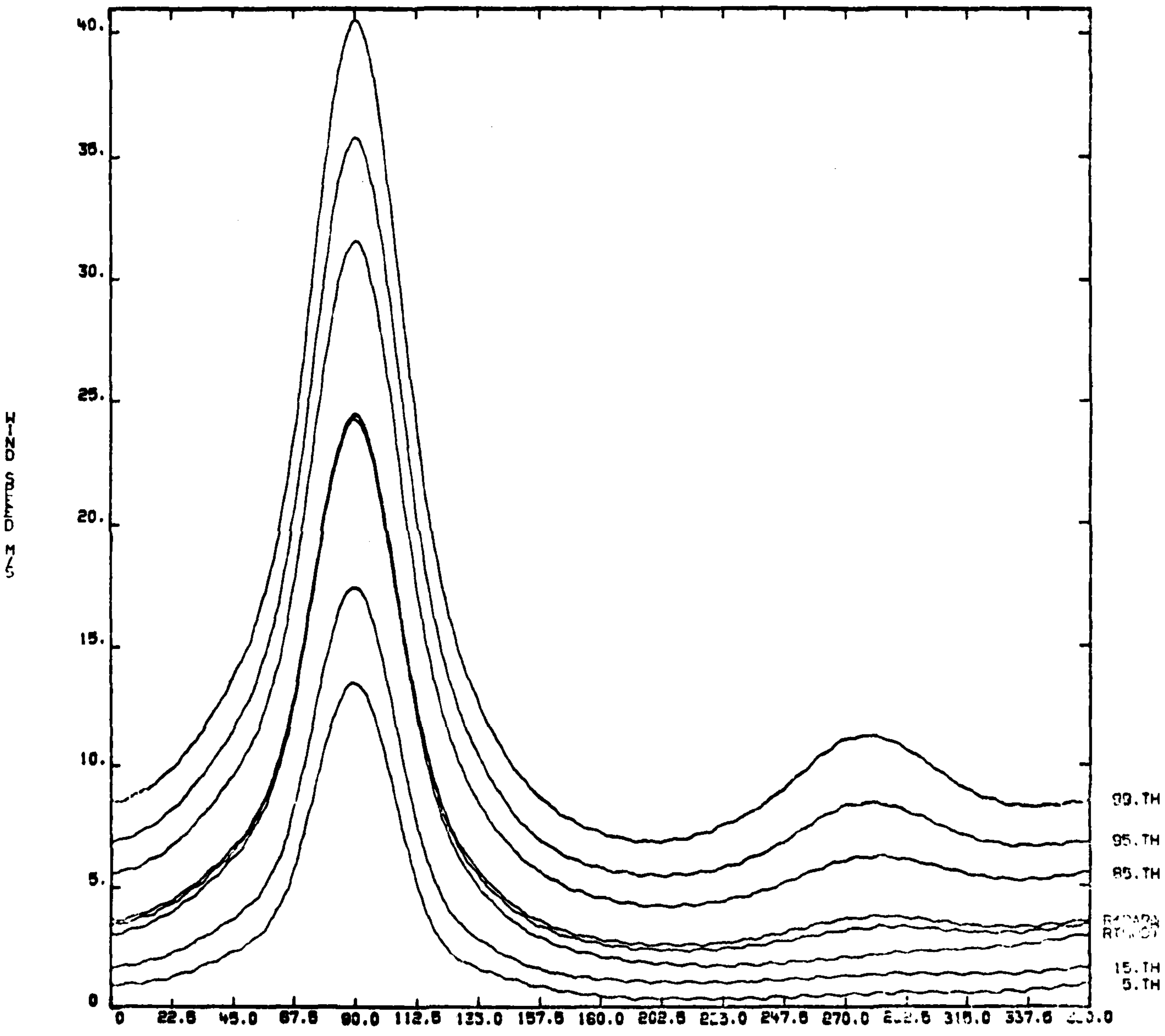


Fig. A-70.

STATION=TAQUAC MONTH=JUL ALT=28KM

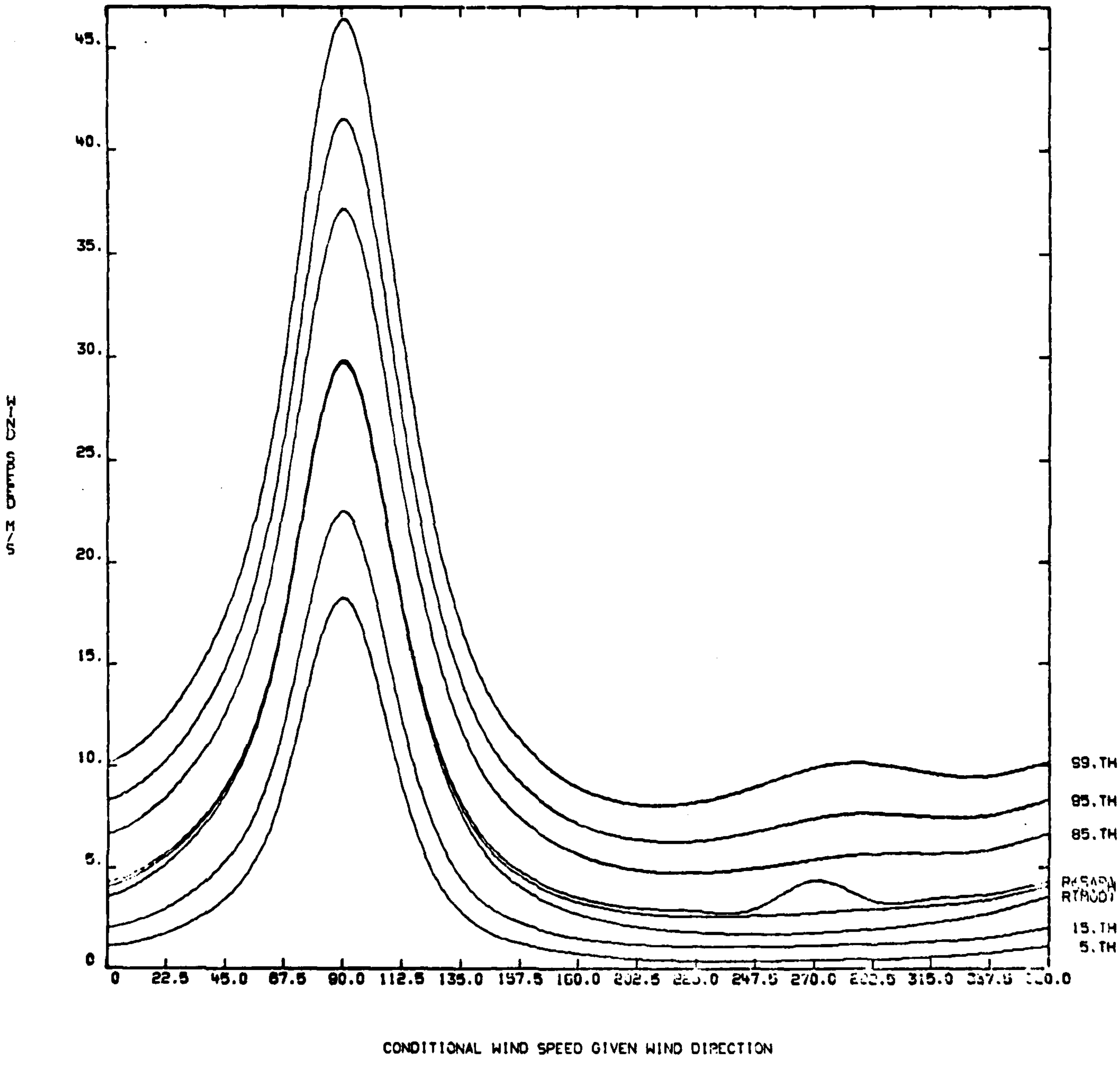


Fig. A-71.

STATION=TAQUAC MONTH=JUL ALT=30KM

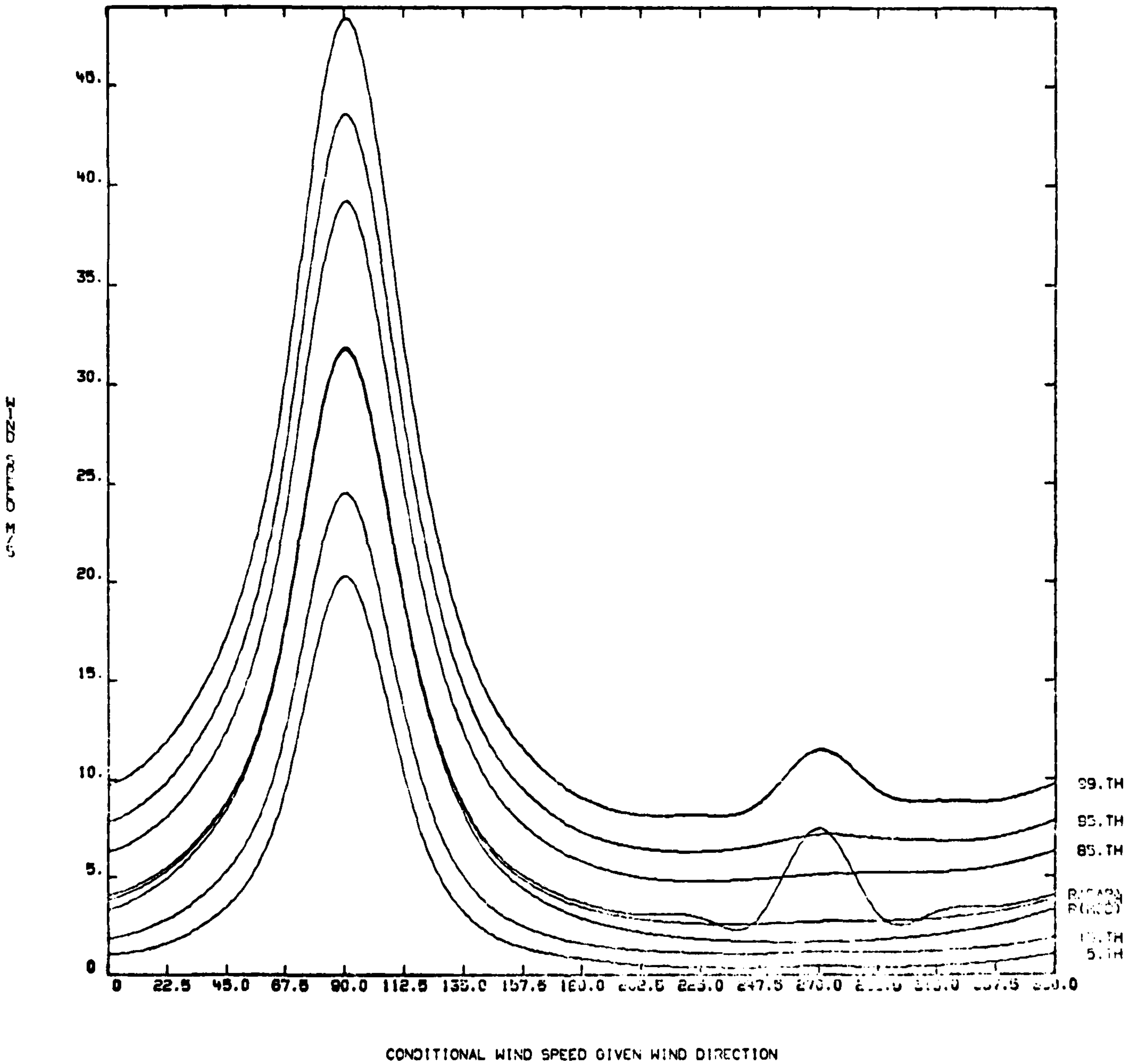


Fig. A-72.

APPENDIX B

RANGE SPECIFIC INFORMATION AND THERMODYNAMIC QUANTITIES FOR TAQUAC, GUAM ISLAND

1. Range Specific Information

To prevent further character size reduction for tables I through IV, certain range-specific information has been omitted. This important information is given in table B-1.

TABLE B-1

Header Record 0-30 Km

Table Number	0
Data Source (1 = DATSAV, 2 = WDC-A)	1
Call Letters	PGAC
WMO Number	912170
Latitude	13.33
Direction (N or S)	N
Longitude	144.51
Direction (E or W)	E
Elevation in Meters	111
Start Period of Record (Mo-Yr)	173
End Period of Record (Mo-Yr)	1279
No. of Time Windows (0, 1 or 2)	2
Start Time Window #1 (Hr-MNZ)	2200
End Time Window #1	200
Start Time Window #2	1000
End Time Window #2	1400
Date of RRA	1080
Altitude Range of RRA Low Level (Km)	0
Altitude Range of RRA High Level (Km)	30
Standard Deviation of Thermodynamic Limits	6.0
Wind Limits	6.0

2. Thermodynamic Quantities

This section presents examples of further computations and graphical displays of pressure, density, and virtual temperature statistics that can be derived from data given in tables II, III, and IV. No attempt is made to present complete nor exhaustive illustrations that can be made to aid in visualizing the relationships that can be made from the data in tables II and IV. The choices are those that aided the committee to verify the reasonableness of the tabulations.

2.1 Monthly Means from the Annual Mean

The hydrostatic model values in table IV are used to compute (1) the monthly mean differences relative to the annual mean values of pressure,

2.1 Monthly Means from the Annual Mean

The hydrostatic model values in table IV are used to compute (1) the monthly mean differences relative to the annual mean values of pressure, density, and virtual temperature expressed in percent and (2) the monthly mean difference in virtual temperature for the annual mean virtual temperature expressed in degrees Kelvin. Examples of these four statistics are given in table B-2 for January and table B-3 for July. Graphical displays of the four statistics contained in tables B-2 and B-3 are shown in figures B-1 through B-8. Also, the relative differences between the monthly mean values from table IV-1 through IV-12 for all months from the annual mean values (table IV-13) are illustrated in figure B-9 for pressure, in figure B-10 for density, and in figure B-11 for virtual temperature. The monthly mean virtual temperature differences from the annual mean virtual temperature for all months are given in figure B-12. The simple sum of the monthly mean differences from the annual mean values of these quantities is not zero. This is because the annual mean statistical parameters are computed (see section III. C.3 of text) by weighting the monthly means by the number of observations of each month.

2.2 Coefficients of Variation and Derived Correlation Coefficients

The coefficient of variation, C_V, is defined by the standard deviation with respect to the mean divided by the mean. The coefficients of variation for pressure, C_VP, and density, C_VD, were computed using the standard deviations from table II and the hydrostatic mean values from table IV. The coefficient of variation for temperature uses the standard deviations of virtual temperature from table III to the altitude where virtual temperature exists. Above this altitude, the standard deviations of temperature are from table II. The mean values for temperature (virtual temperature to the altitude where it exists) are taken from table IV. No distinction is made in the table headings in table B-4 (January) and table B-5 (July) and all related figures between virtual temperature and temperature.

From the coefficients of variation for pressure, density, and temperature (virtual temperature to the altitude where it exists), the correlation coefficients between these quantities are derived using Buell's method (see reference in text). The equations for these derived correlation coefficients are

$$r(P,T) = \frac{(C_VT)^2 + (C_VP)^2 - (C_VD)^2}{2[C_VT \cdot C_VP]} \quad . \tag{B-1}$$

$$r(P,D) = \frac{(C_VD)^2 - (C_VT)^2 + (C_VP)^2}{2[C_VD \cdot C_VP]} \quad . \tag{B-2}$$

$$r(T,D) = \frac{(C_VP)^2 - (C_VD)^2 - (C_VT)^2}{2[C_VT \cdot C_VD]} \quad . \tag{B-3}$$

The correlation coefficients in tables B-4 and B-5 are derived from the above equations.

A test for the validity of the derived correlation coefficients is that all three of the following inequalities be satisfied.

$$C_VP - [C_VD + C_VT] < 0$$

$$C_VD - [C_VT + C_VP] < 0 \qquad \text{(B-4)}$$

$$C_VT - [C_VP + C_VD] < 0$$

In these examples (tables B-4 and B-5) the numerical values from equation (B-4) are all negative; hence, the derived correlation test is considered valid. The rare exceptions to this test for several RRAs occur at the extreme highest altitudes, where samples sizes for the statistical sample are small.

The statistical parameters from table B-4 (January) and table B-5 (July) are illustrated in figures B-13 through B-16.

For all months the C_VP values are shown in figure B-17, the C_VD values are shown in figure B-18, and C_VT values are shown in figure B-19. If the abscissa on the figures for the coefficient of variation were multiplied by 100, these figures would show the percentage of the random dispersion of these quantities over the month with respect to the monthly mean for these thermodynamic quantities.

The derived correlation coefficients for all months are illustrated in the following figures:

a) Figure B-20 gives r(P,D).

b) Figure B-21 gives r(P,T).

c) Figure B-22 gives r(T,D).

TABLE B-2

STATION 912170 MONTH 1
DELTAS IN PERCENT RELATIVE TO ANNUAL

LEVEL	PRESSURE	DENSITY	TEMP.	TMO-TANN(DEG.K)
.000	.10	.52	-.44	-1.32
.111	.09	.52	-.42	-1.26
1.000	.05	.47	-.42	-1.24
2.000	.01	.25	-.24	-.70
3.000	.00	-.05	.05	.15
4.000	.01	-.08	.09	.25
5.000	.02	-.07	.09	.24
6.000	.03	-.02	.05	.14
7.000	.04	-.05	.10	.25
8.000	.06	-.08	.14	.36
9.000	.09	[illegible]	.12	.30
10.000	.09	-.05	.14	.34
11.000	.12	-.08	.19	.43
12.000	.14	-.09	.23	.52
13.000	.18	-.07	.28	.60
14.000	.23	-.08	.31	.65
15.000	.27	.13	.16	.33
16.000	.25	.65	-.42	-.81
17.000	.05	2.00	-1.87	-3.61
18.000	-.33	2.05	-2.35	-4.60
19.000	-.67	.95	-1.57	-3.15
20.000	-.87	-.01	-.86	-1.78
21.000	-1.00	-.20	-.81	-1.69
22.000	-1.12	-.49	-.64	-1.37
23.000	-1.21	-.67	-.55	-1.19
24.000	-1.30	-.77	-.52	-1.14
25.000	-1.39	-.71	-.69	-1.51
26.000	-1.50	-.70	-.82	-1.82
27.000	-1.64	-.72	-.93	-2.09
28.000	-1.79	-.75	-1.03	-2.34
29.000	-1.93	-.89	-1.05	-2.41
30.000	-2.08	-.98	-1.08	-2.49

TABLE B-3

STATION 912170 MONTH 7
DELTAS IN PERCENT RELATIVE TO ANNUAL

LEVEL	PRESSURE	DENSITY	TEMP.	TMO-TANN(DEG.K)
.000	-.09	-.26	.19	.58
.111	-.09	-.26	.19	.57
1.000	-.07	-.38	.27	.81
2.000	-.04	-.21	.16	.46
3.000	-.03	-.01	-.01	-.03
4.000	-.04	.11	-.16	-.44
5.000	-.07	.14	-.21	-.57
6.000	-.09	.09	-.18	-.48
7.000	-.11	.03	-.13	-.35
8.000	-.13	.00	-.12	-.30
9.000	-.14	-.02	-.11	-.28
10.000	-.16	-.05	-.13	-.31
11.000	-.18	.00	-.20	-.46
12.000	-.22	.06	-.28	-.63
13.000	-.27	.10	-.36	-.78
14.000	-.34	.11	-.44	-.91
15.000	-.40	.04	-.44	-.88
16.000	-.44	-.55	.09	.18
17.000	-.22	-2.53	2.39	4.52
18.000	.24	-2.76	3.06	5.39
19.000	.68	-1.47	2.19	4.40
20.000	.97	-.39	1.36	2.80
21.000	1.16	.20	.94	1.98
22.000	1.28	.63	.65	1.33
23.000	1.37	.88	.47	1.02
24.000	1.45	1.00	.44	.95
25.000	1.50	1.21	.29	.63
26.000	1.53	1.36	.17	.38
27.000	1.55	1.50	.05	.12
28.000	1.56	1.52	.06	.13
29.000	1.57	1.68	-.11	-.25
30.000	1.54	1.80	-.25	-.57

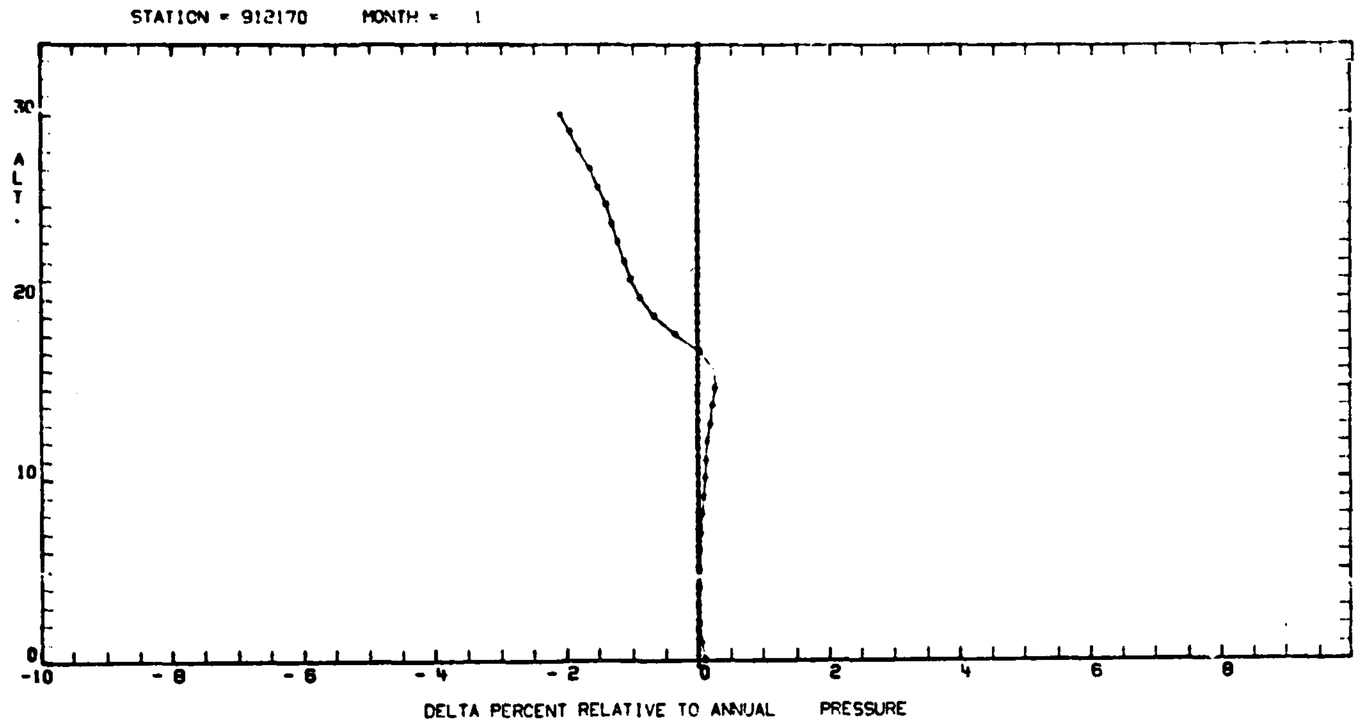

STATION = 912170 MONTH = 1
ALT.
DELTA PERCENT RELATIVE TO ANNUAL PRESSURE

Fig. B-1.

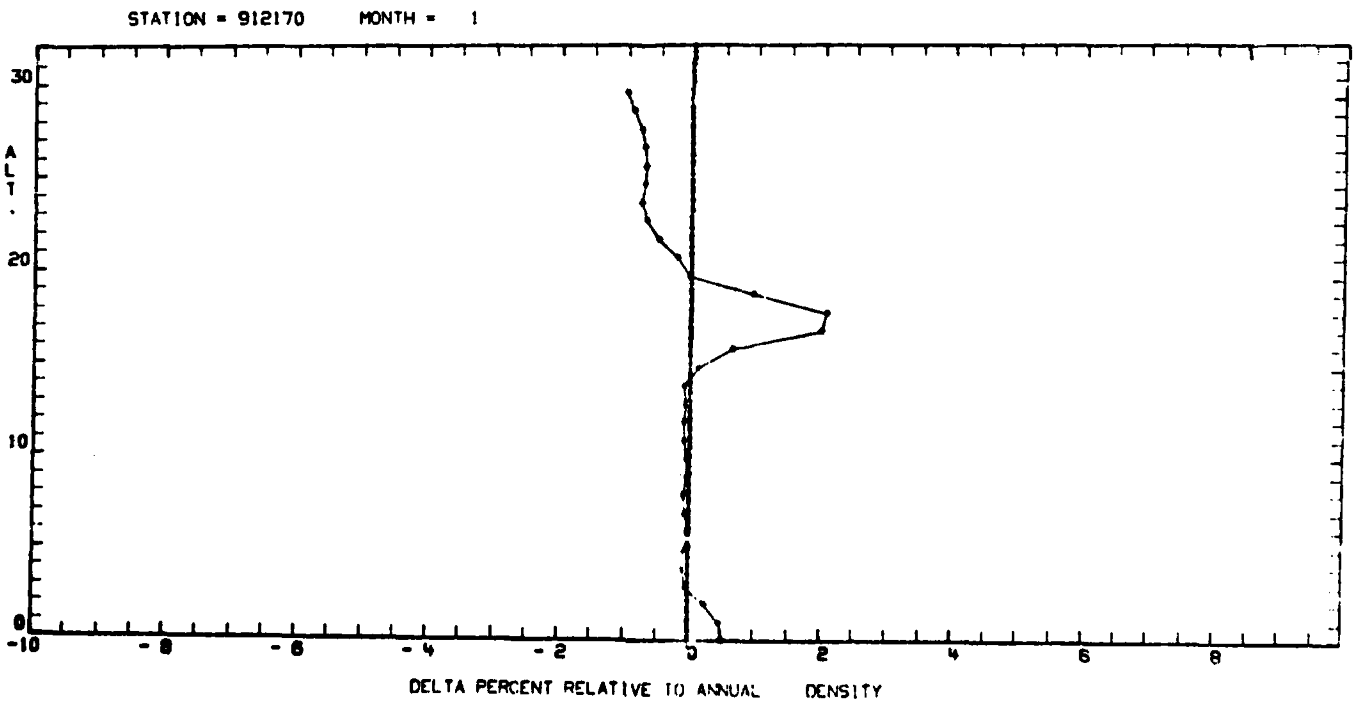

STATION = 912170 MONTH = 1
ALT.
DELTA PERCENT RELATIVE TO ANNUAL DENSITY

Fig. B-2.

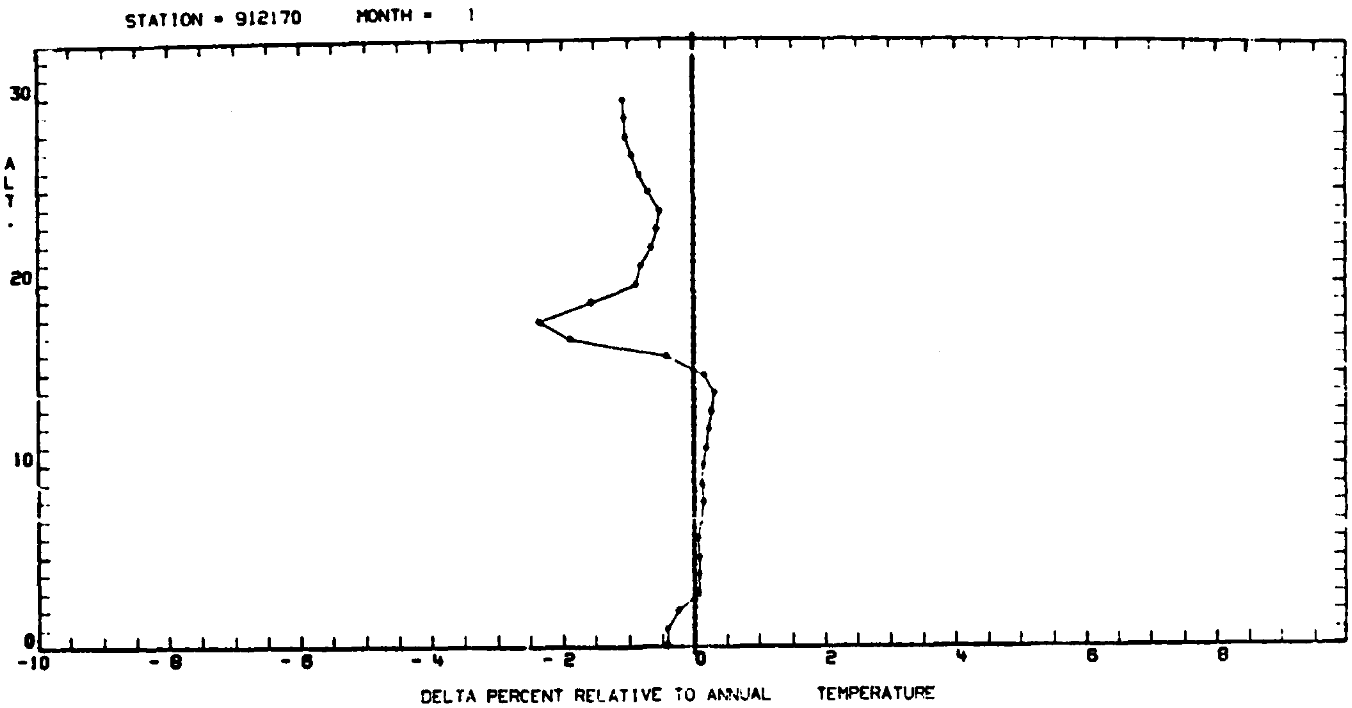

STATION = 912170 MONTH = 1
ALT.
30
20
10
0
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL TEMPERATURE

Fig. B-3.

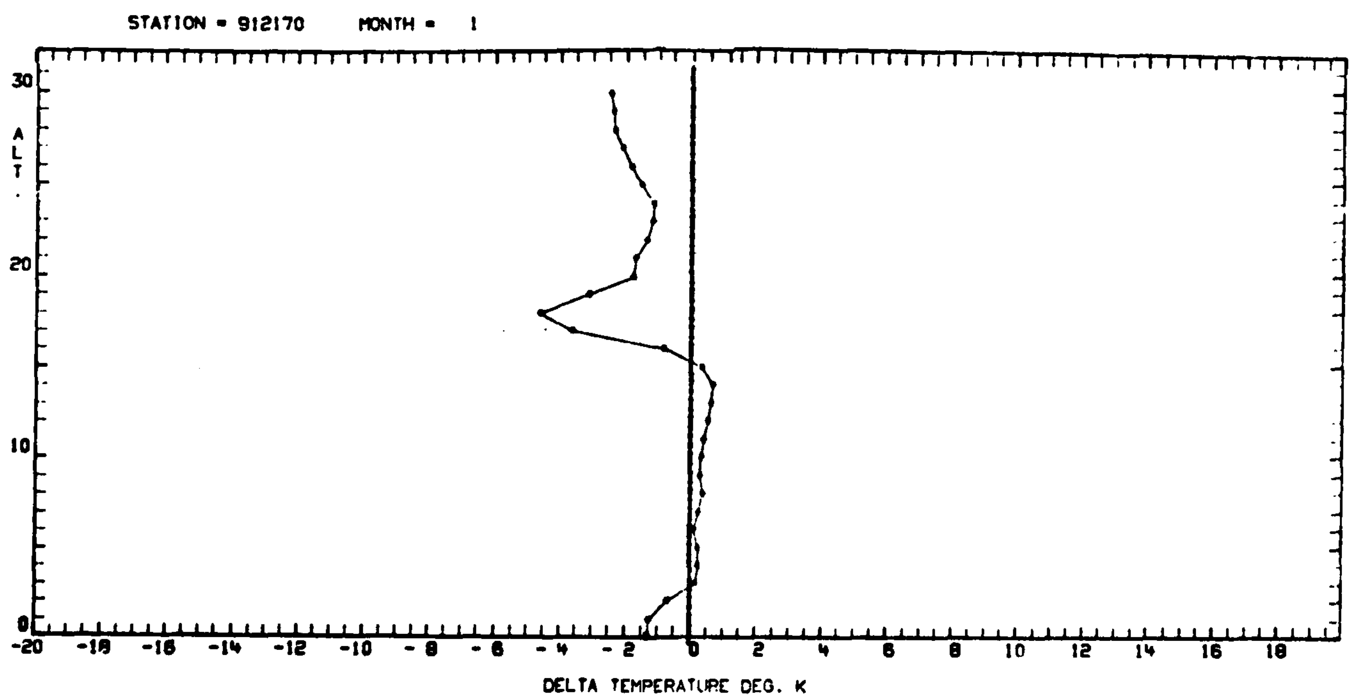
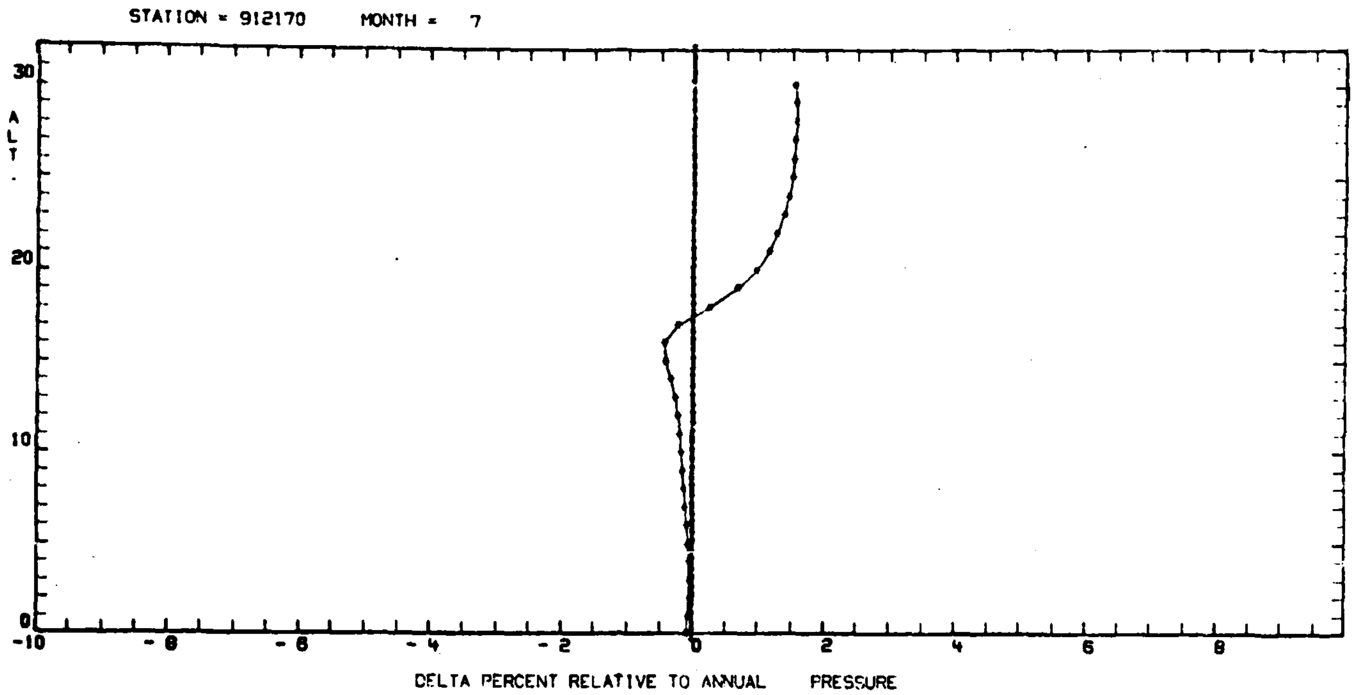
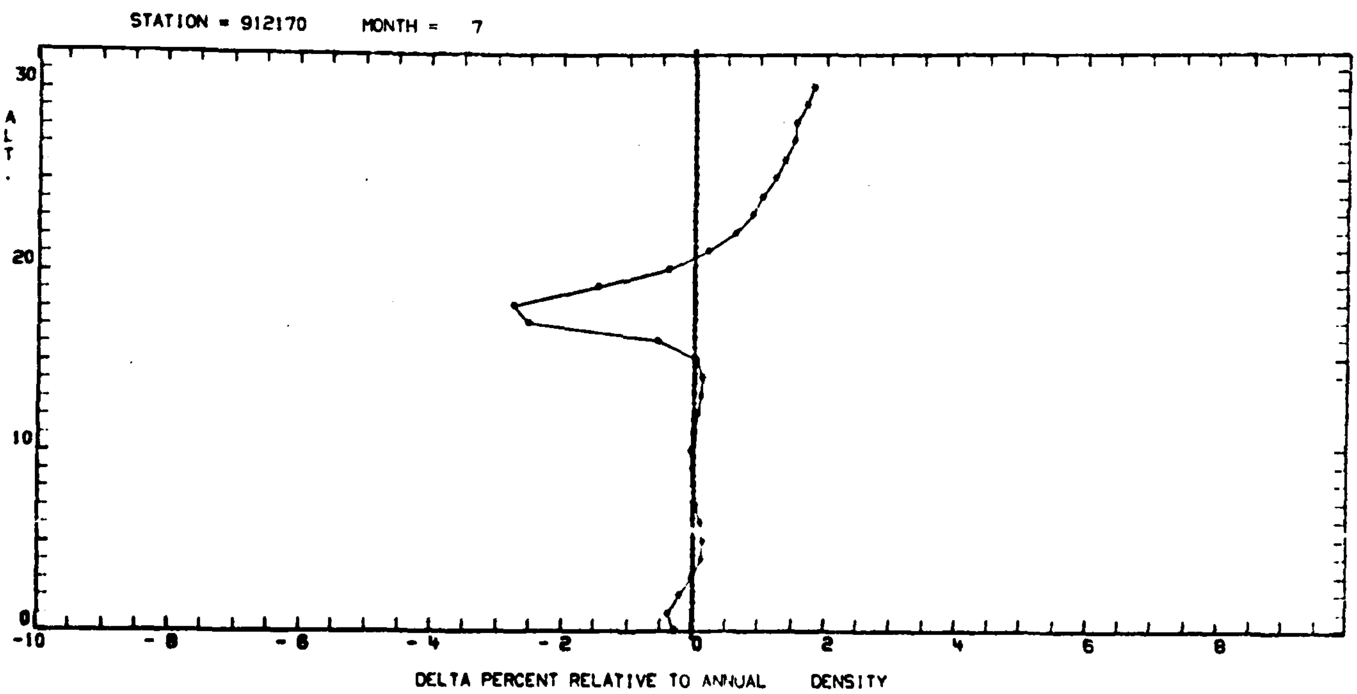

STATION = 912170 MONTH = 1
ALT.
30
20
10
0
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
14
16
18
DELTA TEMPERATURE DEG. K

Fig. B-4.



STATION = 912170 MONTH = 7
ALT.
30
20
10
0
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL PRESSURE

Fig. B-5.



STATION = 912170 MONTH = 7
ALT.
30
20
10
0
-10
-8
-6
-4
-2
0
2
4
6
8
DELTA PERCENT RELATIVE TO ANNUAL DENSITY

Fig. B-6.

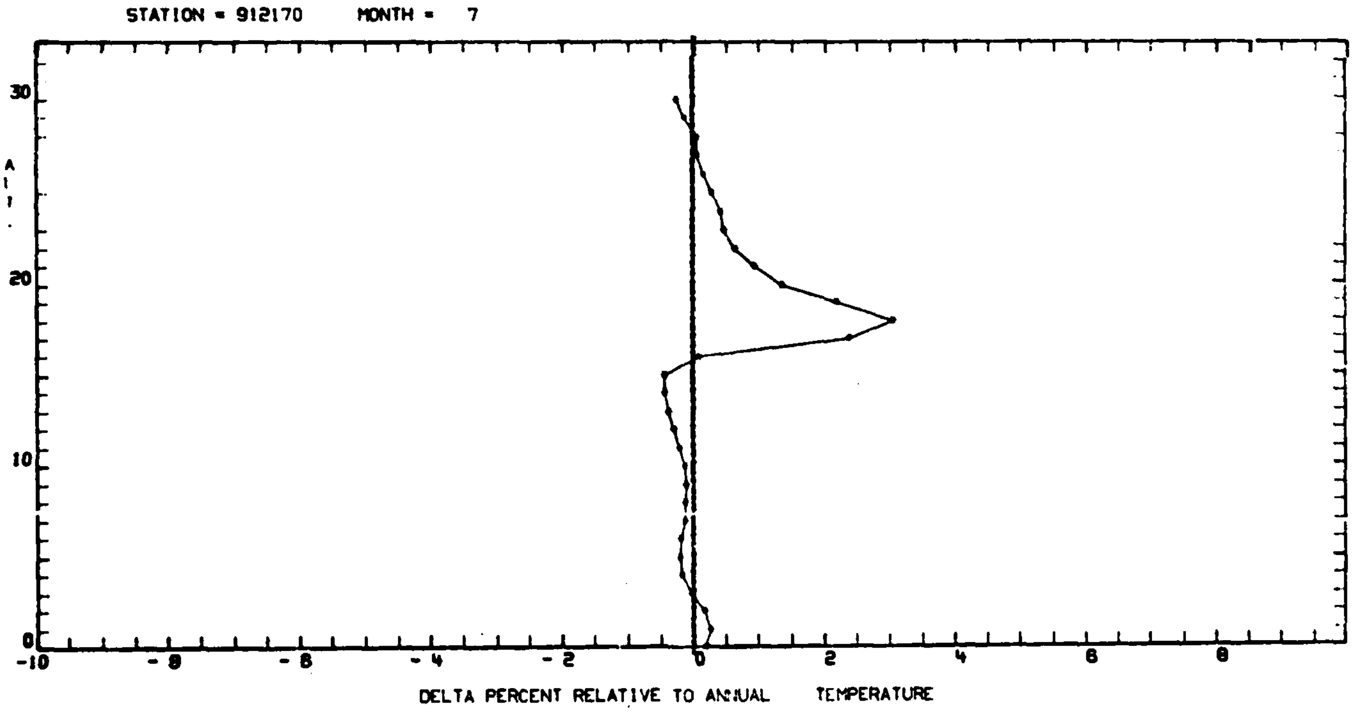

STATION = 912170 MONTH = 7
ALT.
DELTA PERCENT RELATIVE TO ANNUAL TEMPERATURE

Fig. B-7.

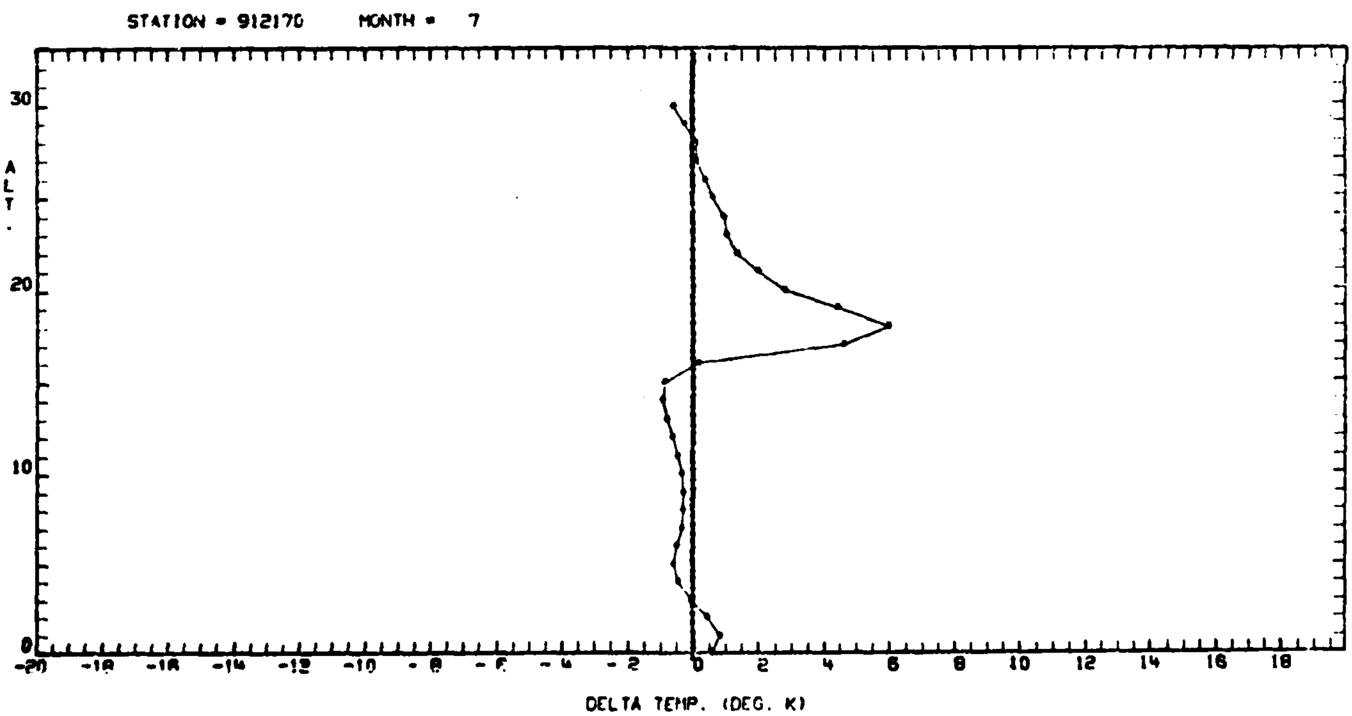

STATION = 912170 MONTH = 7
ALT.
DELTA TEMP. (DEG. K)

Fig. B-8.

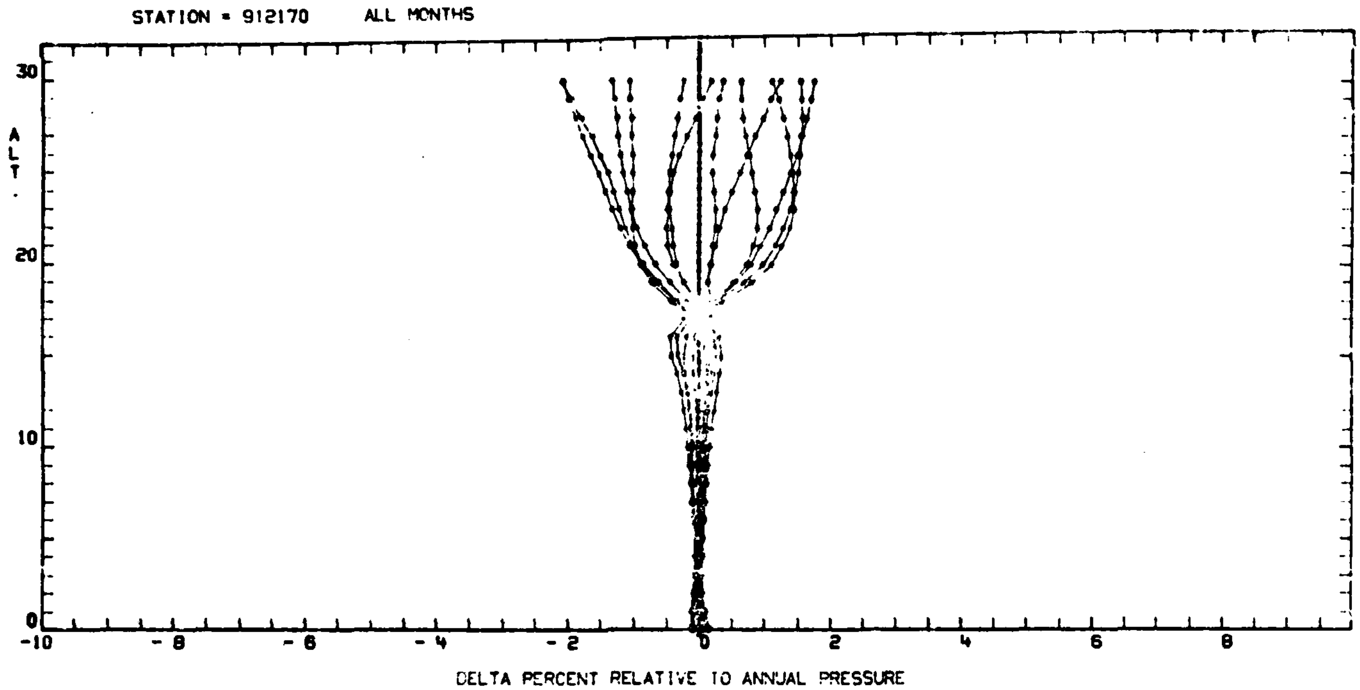


Fig. B-9.

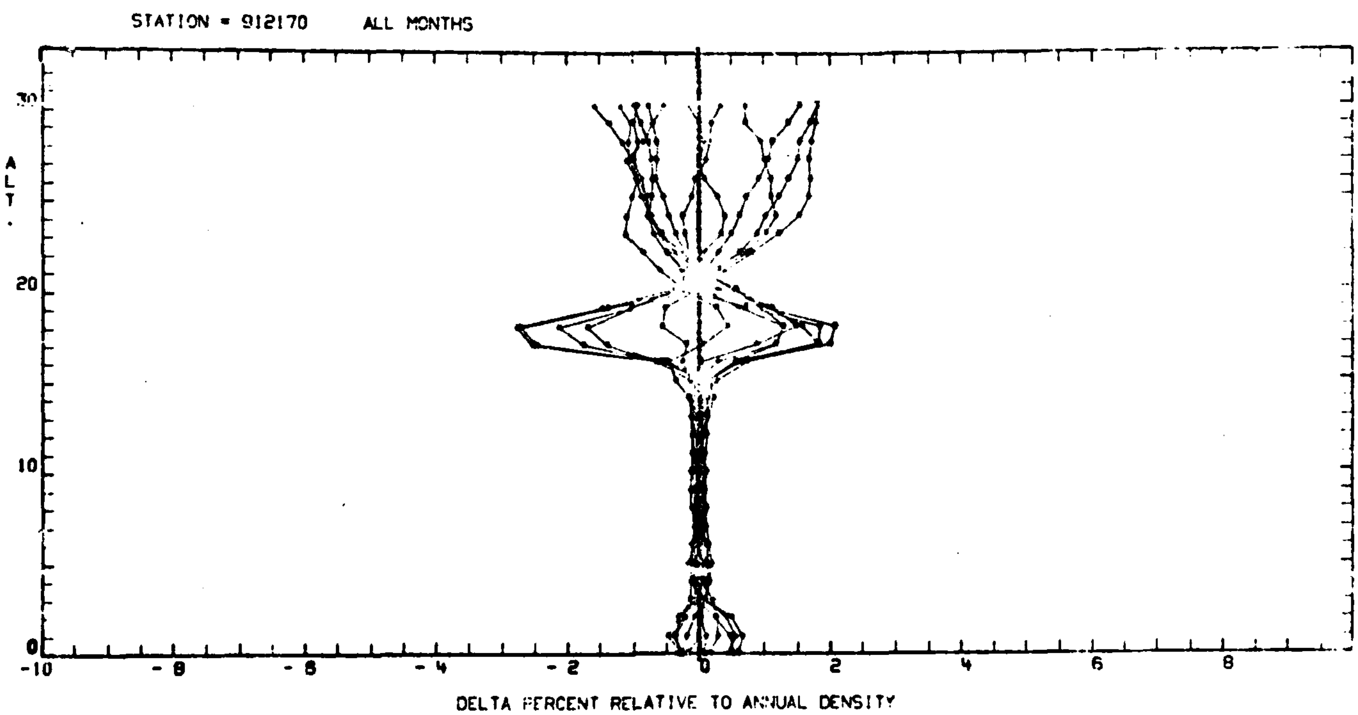


Fig. B-10.

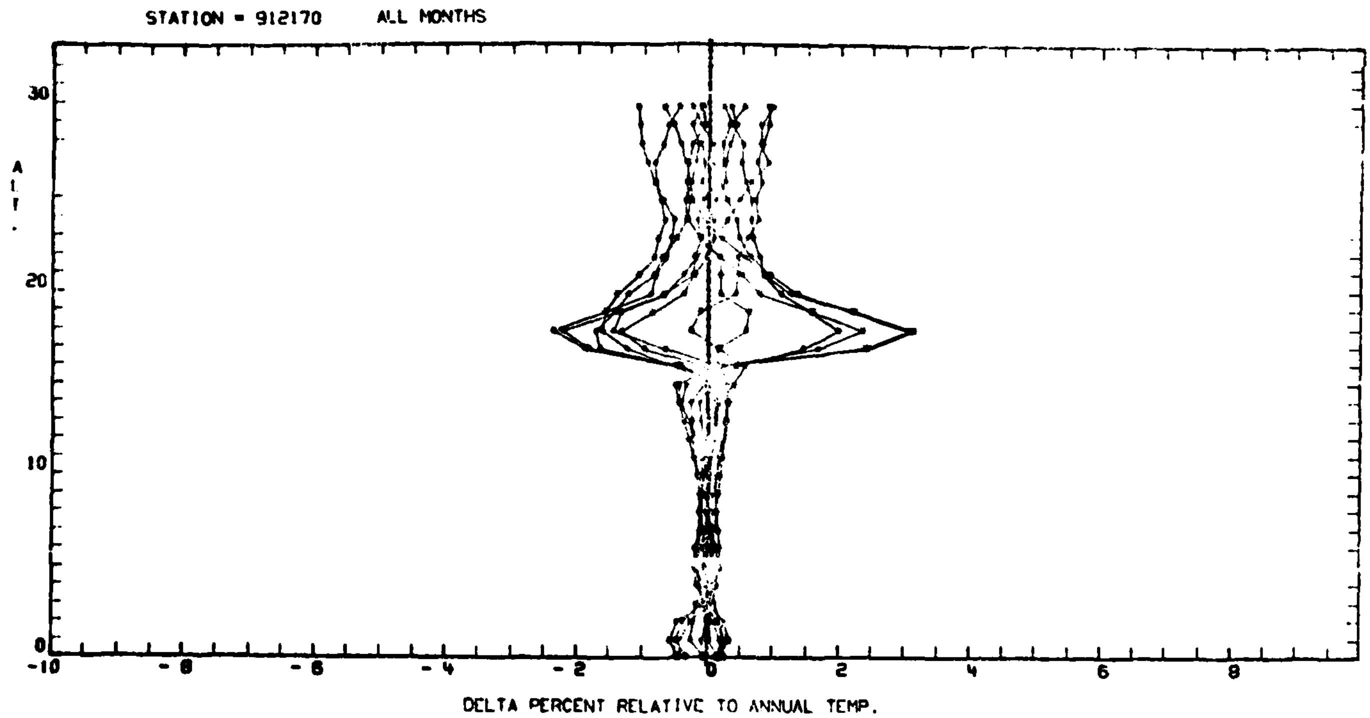


Fig. B-11.

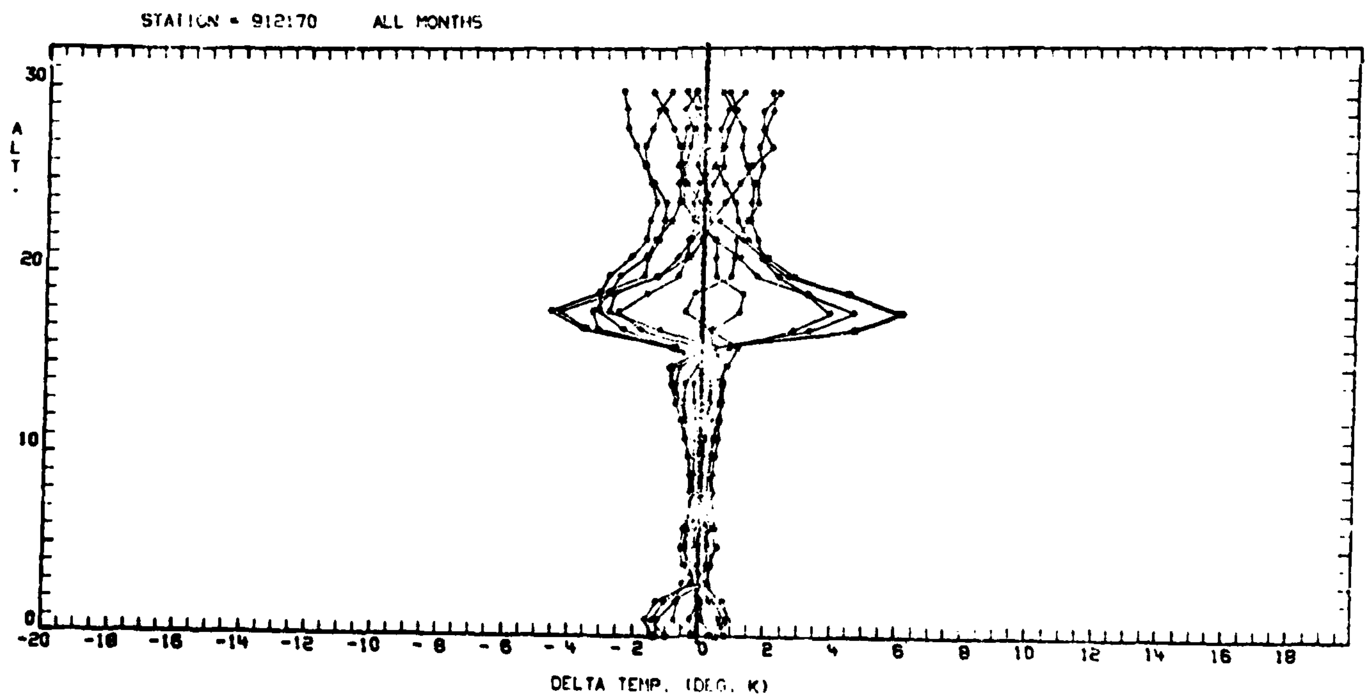


Fig. B-12.

TABLE B-4

STATION 912170 MONTH 1

LEVEL	CVP	CVD	CVT	R(P,T)	R(P,D)	R(T,D)	DCVP	DCVD	DCVT
.000	.0022	.0057	.0052	-.0166	.4006	-.9229	-.0087	-.0017	-.0027
.111	.0022	.0054	.0050	.0099	.7973	-.9137	-.0082	-.0018	-.0027
1.000	.0021	.0048	.0039	-.1983	.5598	-.9032	-.0066	-.0012	-.0030
2.000	.0020	.0063	.0060	.0418	[illegible]	-.9657	[illegible]	[illegible]	[illegible]
3.000	.0022	.0053	.0043	.2052	.1109	-.9163	-.0064	[illegible]	[illegible]
4.000	.0024	.0050	.0051	.2834	.1835	-.8879	-.0077	[illegible]	[illegible]
5.000	.0026	.0046	.0049	.3583	.1922	-.8473	-.0068	-.0039	-.0024
6.000	.0029	.0052	.0051	.2590	.3073	-.8396	-.0073	-.0028	-.0030
7.000	.0031	.0046	.0051	.4479	.1687	-.8057	-.0066	-.0035	-.0026
8.000	.0034	.0042	.0047	.5101	.2473	-.7073	-.0054	-.0040	-.0029
9.000	.0037	.0039	.0046	.5808	.2715	-.6259	-.0048	-.0044	[illegible]
10.000	.0042	.0041	[illegible]	[illegible]	.2071	-.5951	[illegible]	-.0050	-.0033
11.000	.0046	.0037	.0051	.7188	.2614	-.4832	-.0041	-.0060	-.0032
12.000	.0051	.0034	.0053	.7866	.2702	-.3819	-.0036	-.0070	-.0032
13.000	.0060	.0040	.0060	.7699	.3433	-.3352	-.0040	-.0079	.0041
14.000	.0065	.0051	.0070	.7143	.3083	-.4455	-.0055	-.0084	-.0047
15.000	.0075	.0063	.0073	.6391	.4497	-.3996	-.0061	-.0085	-.0055
16.000	.0082	.0080	.0086	.5484	.4391	-.5114	-.0084	-.0088	-.0076
17.000	.0090	.0123	.0113	.2889	.4893	-.7099	-.0146	-.0081	-.0100
18.000	.0095	.0187	.0152	-.1039	.5913	-.8635	-.0244	-.0060	-.0130
19.000	.0091	.0173	.0149	.0155	.5105	-.8519	-.0231	.0066	-.0115
20.000	.0092	.0166	.0133	-.0594	.6018	-.8330	-.0207	-.0059	-.0125
21.000	.0090	.0136	.0115	.1422	.5442	-.7530	-.0151	.0070	-.0111
22.000	.0095	.0129	.0117	.2731	.4868	-.7074	-.0151	-.0083	-.0105
23.000	.0101	.0124	.0119	.3800	.4520	-.6534	-.0142	-.0097	-.0106
24.000	.0104	.0108	.0108	.4861	.4761	-.5371	-.0112	-.0105	-.0103
25.000	.0114	.0109	.0103	.5049	.5721	-.4191	-.0098	-.0109	-.0120
26.000	.0123	.0125	.0097	.3776	.6919	-.4073	-.0093	-.0096	-.0151
27.000	.0134	.0133	.0094	.3570	.7496	-.3405	-.0093	-.0096	-.0172
28.000	.0136	.0135	.0091	.3520	.7745	-.3195	-.0099	-.0093	-.0180
29.000	.0144	.0148	.0110	.3413	.7162	-.4115	-.0115	-.0106	-.0182
30.000	.0146	.0153	.0107	.2985	.7442	-.4153	-.0114	-.0100	-.0192

TABLE B-5

STATION 912170 MONTH 7

LEVEL	CVP	CVD	CVT	R(P,T)	R(P,D)	R(T,D)	DCVP	DCVD	DCVT
.000	.0018	.0066	.0064	.0057	.2680	-.9619	-.0112	-.0016	-.0021
.111	.0018	.0062	.0060	.0505	.2432	-.9565	-.0104	-.0016	-.0020
1.000	.0019	.0031	.0025	.0384	.5811	-.7909	-.0037	-.0013	-.0025
2.000	.0019	.0034	.0030	.1029	.4654	-.8325	-.0045	-.0015	-.0023
3.000	.0019	.0033	.0031	.2225	.3783	-.8183	-.0044	-.0018	-.0021
4.000	.0022	.0032	.0030	.2498	.4498	-.7525	-.0040	-.0019	-.0024
5.000	.0023	.0035	.0031	.1827	.4830	-.7726	-.0044	-.0019	-.0027
6.000	.0022	.0038	.0037	.2190	.3683	-.8265	-.0053	-.0020	-.0024
7.000	.0025	.0041	.0043	.3578	.2247	-.8295	-.0059	-.0026	-.0023
8.000	.0027	.0042	.0047	.4594	.1229	-.8251	-.0062	-.0031	-.0022
9.000	.0030	.0039	.0049	.5983	.0175	-.7907	-.0059	-.0040	-.0020
10.000	.0034	.0039	.0053	.6957	-.0640	-.7549	-.0056	-.0049	-.0020
11.000	.0039	.0037	.0056	.7556	-.1011	-.7280	-.0054	-.0058	-.0019
12.000	.0046	.0034	.0058	.8080	-.0338	-.6162	-.0047	-.0070	-.0022
13.000	.0055	.0042	.0064	.7572	.1410	-.5393	-.0052	-.0076	-.0034
14.000	.0060	.0058	.0078	.6990	.1301	-.6396	-.0075	-.0081	-.0046
15.000	.0067	.0085	.0091	.4452	.3132	-.7110	-.0110	-.0073	-.0062
16.000	.0073	.0143	.0131	.1084	.4130	-.8506	-.0201	-.0061	-.0085
17.000	.0074	.0159	.0131	-.1386	.5772	-.8887	-.0217	-.0046	-.0102
18.000	.0076	.0121	.0092	-.0277	.6592	-.7775	-.0137	.0047	-.0105
19.000	.0071	.0104	.0088	.1512	.5520	-.7408	-.0121	[illegible]	-.0097
20.000	.0078	.0101	.0090	.2862	[illegible]	-.6720	-.0113	.0067	[illegible]
21.000	.0077	.0097	.0078	.2218	.6137	-.6338	-.0098	[illegible]	-.0095
22.000	.0080	.0111	.0090	.1493	.5904	-.7020	-.0121	-.0059	-.0101
23.000	.0083	.0115	.0099	.1269	.6406	-.6804	-.0119	[illegible]	-.0111
24.000	.0090	.0111	.0086	.2042	.6515	-.6095	-.0109	[illegible]	-.0115
25.000	.0090	.0111	.0082	.1735	.6810	-.6031	-.0103	[illegible]	.0114
26.000	.0095	.0114	.0083	.2278	.6500	-.5919	-.0109	[illegible]	-.0125
27.000	.0100	.0105	.0088	3762	.6462	-.4766	-.0093	[illegible]	-.0117
28.000	.0106	.0111	.0096	.3390	6119	-.4811	-.0101	-.0091	.0121
29.000	.0117	.0111	.0108	.5174	.5500	-.4301	-.0102	-.0114	.0125
30.000	.0127	.0111	.0117	.5901	.5028	-.3797	-.0101	-.0133	.0121

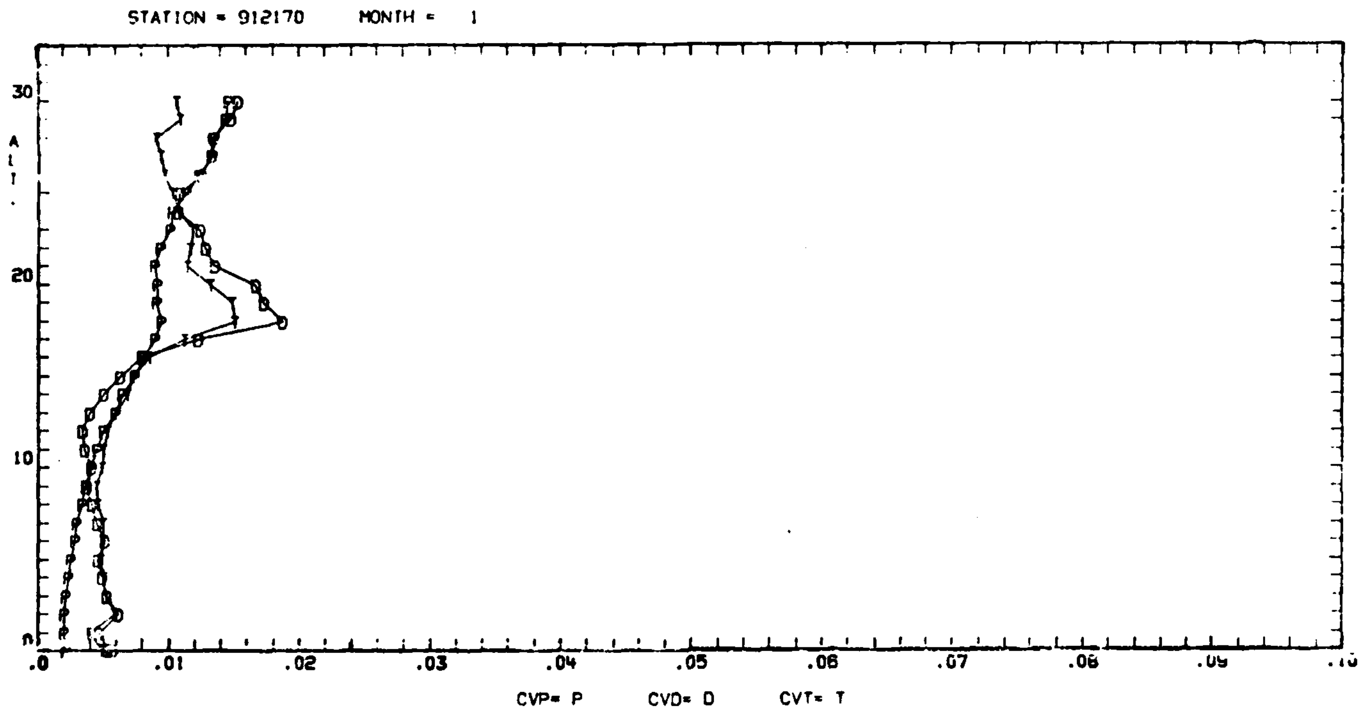


Fig. B-13.

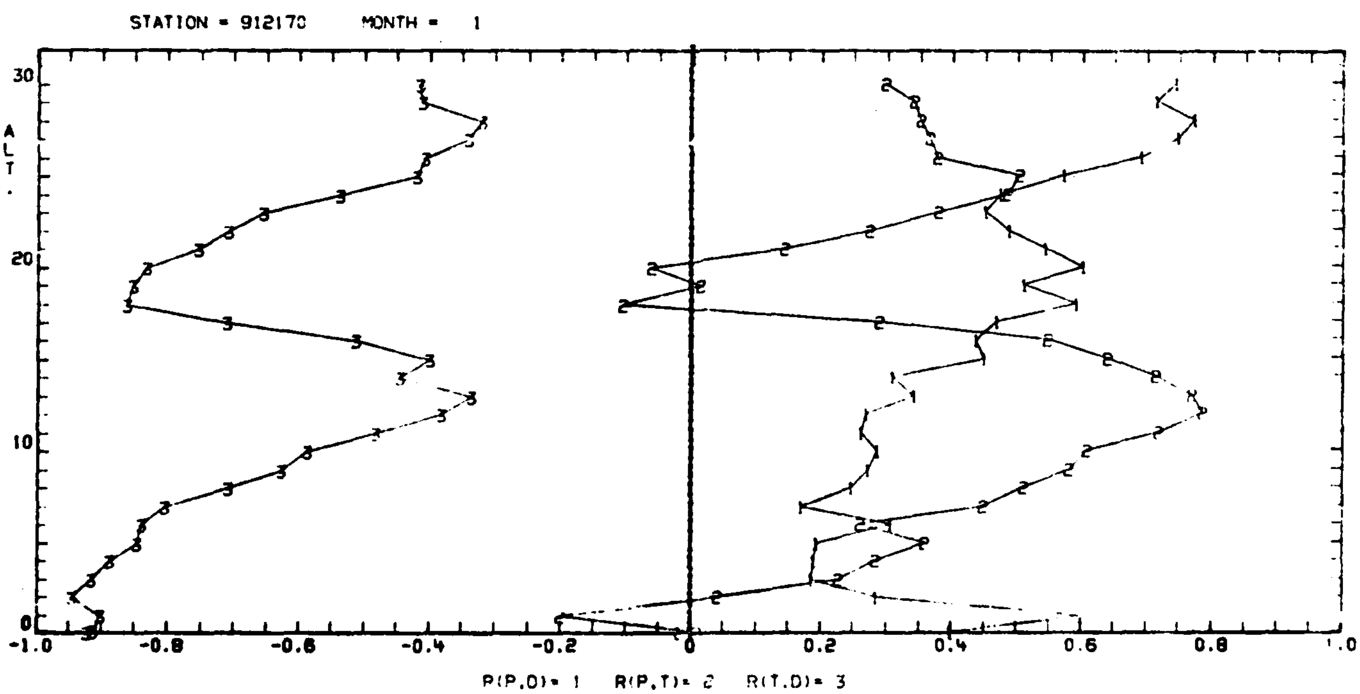


Fig. B-14.

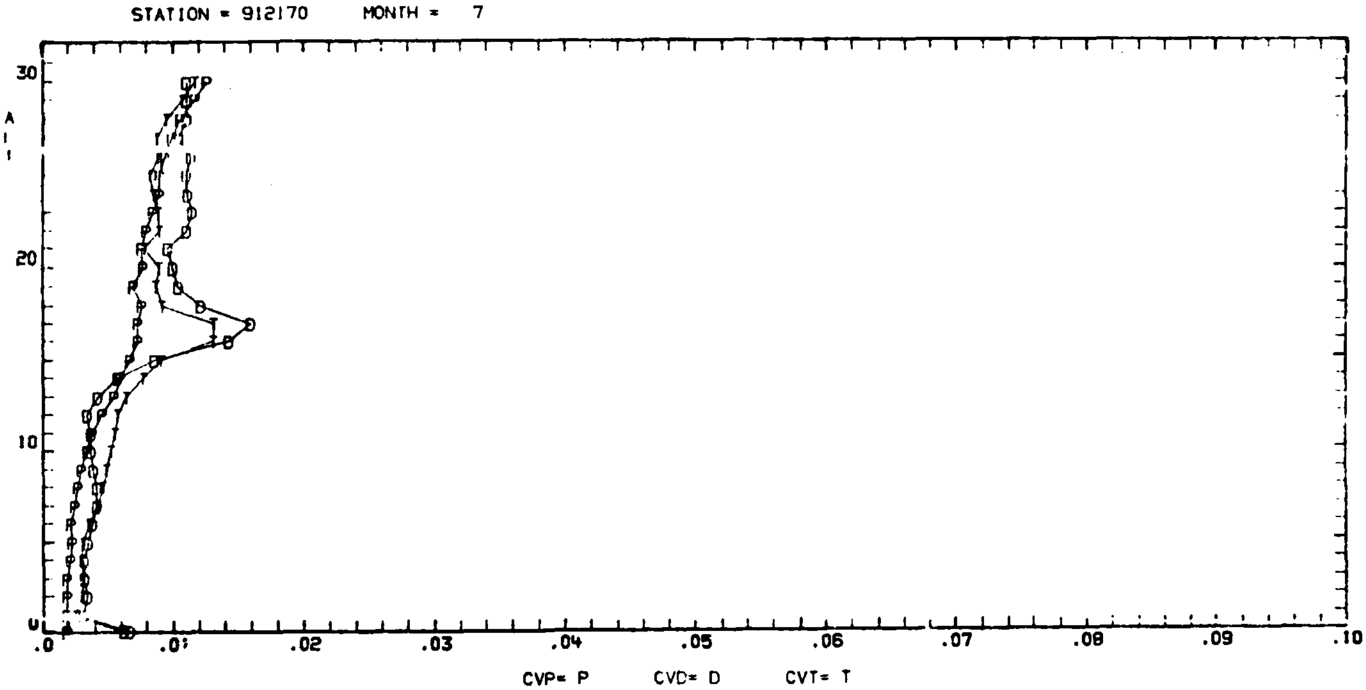


Fig. B-15.

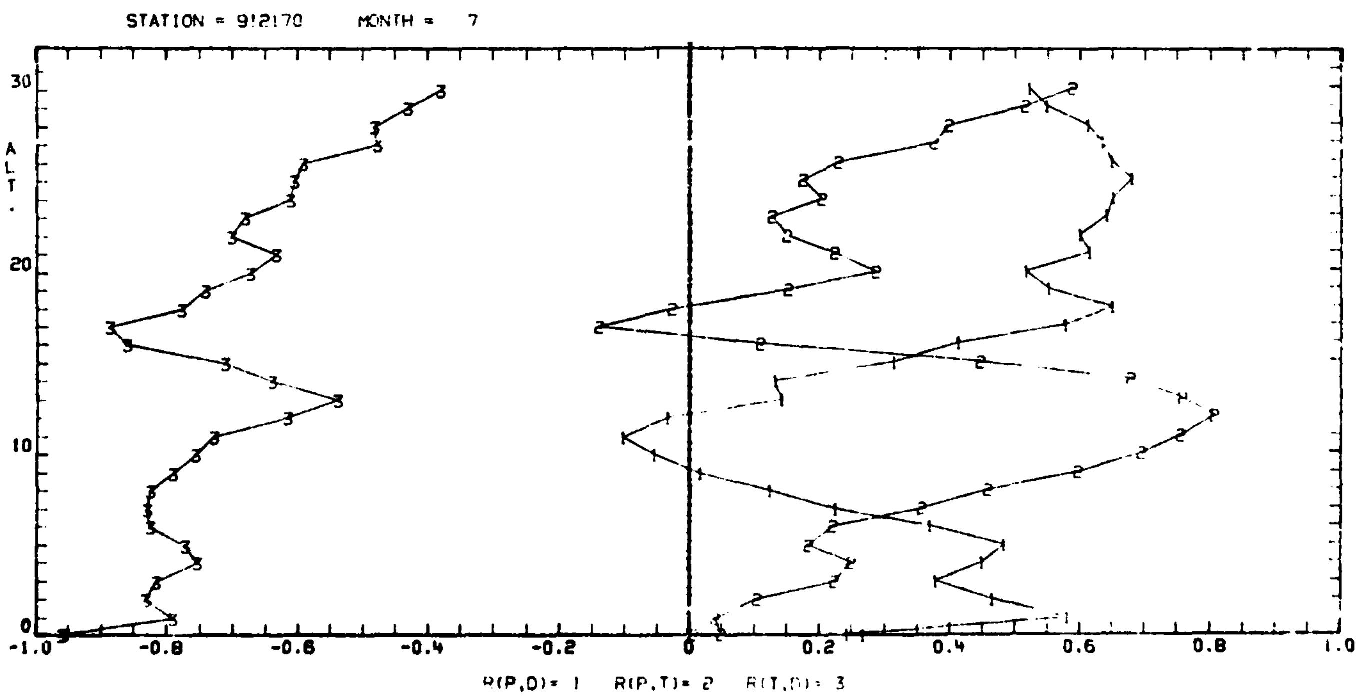


Fig. B-16.

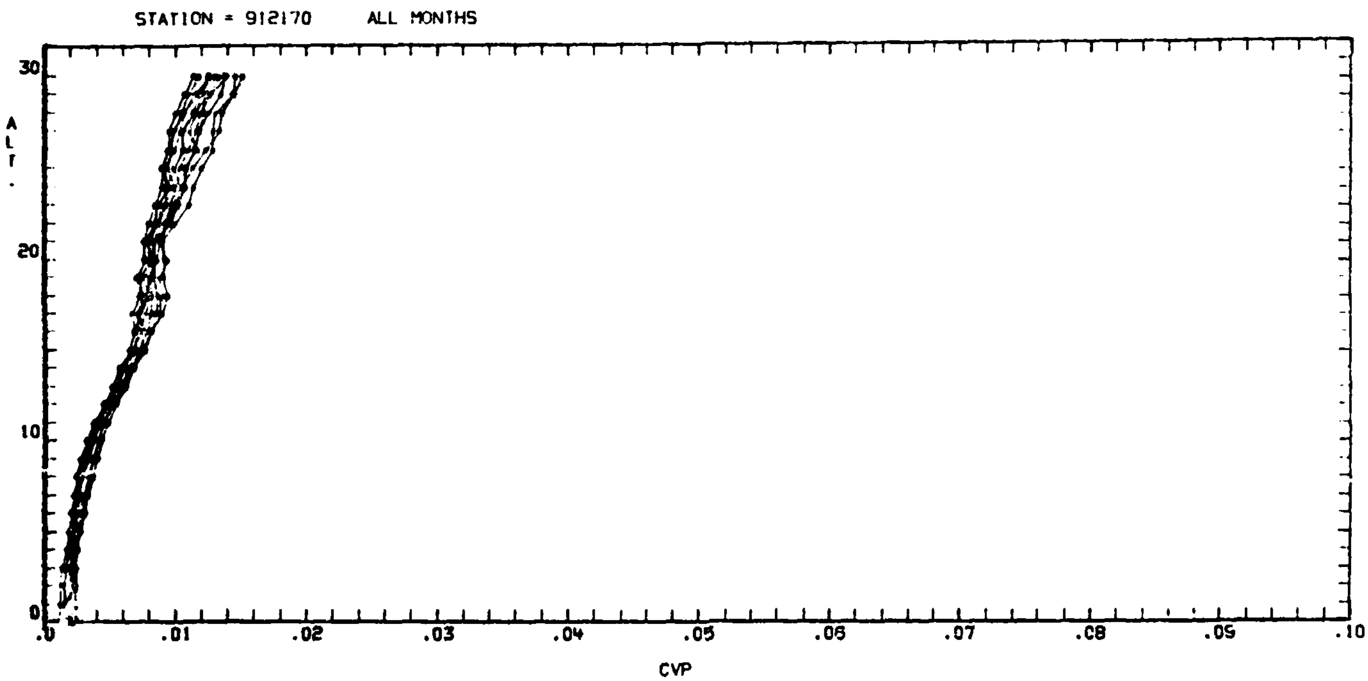


Fig. B-17.

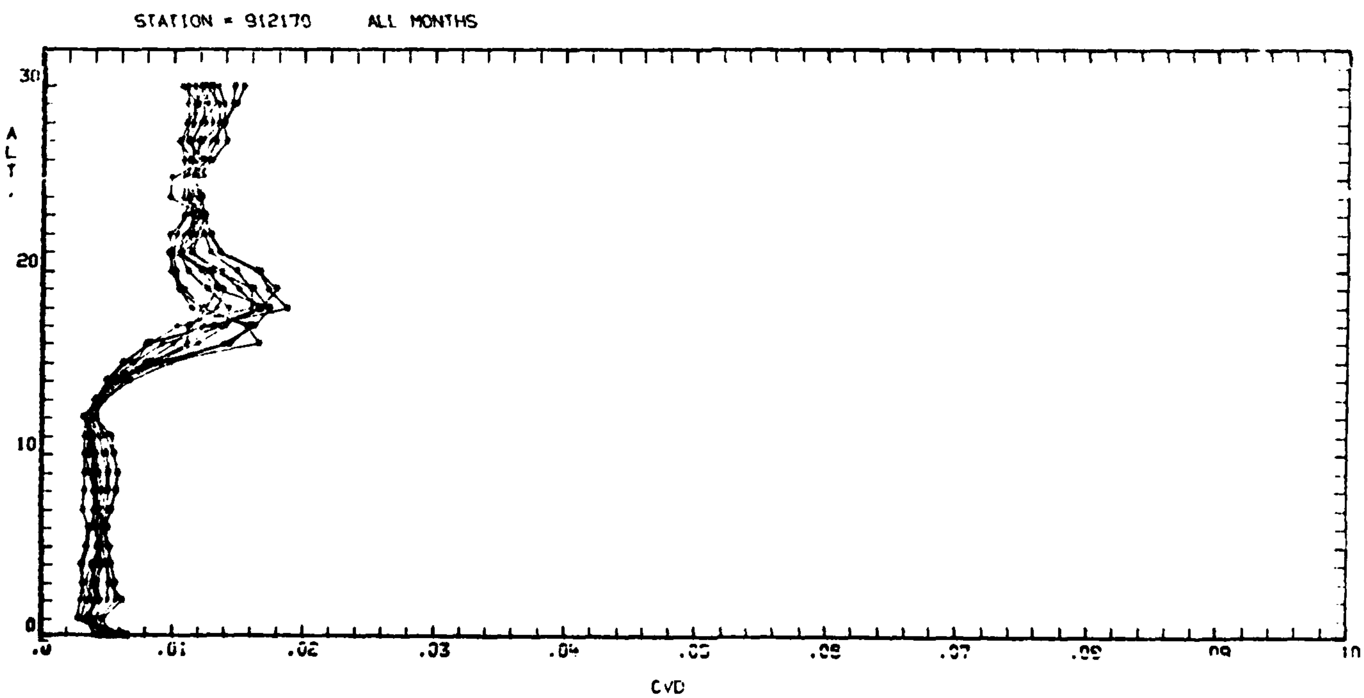


Fig. B-18.

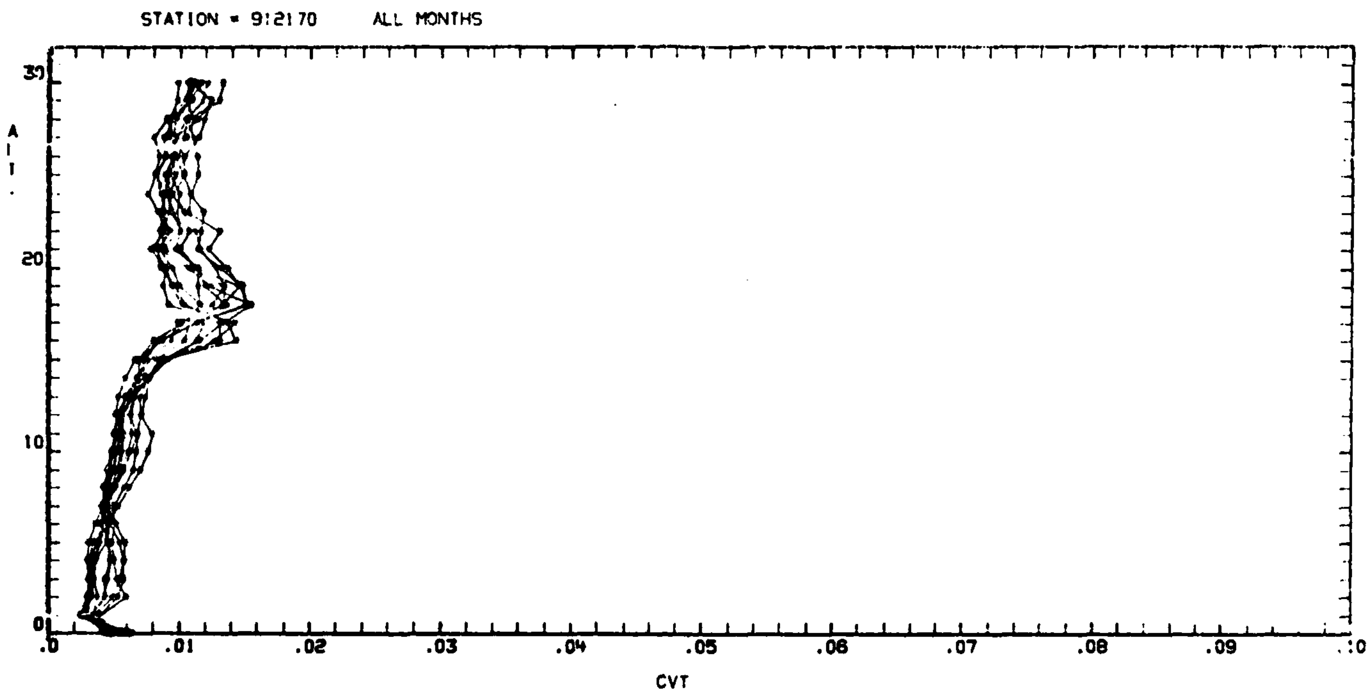


Fig. B-19.

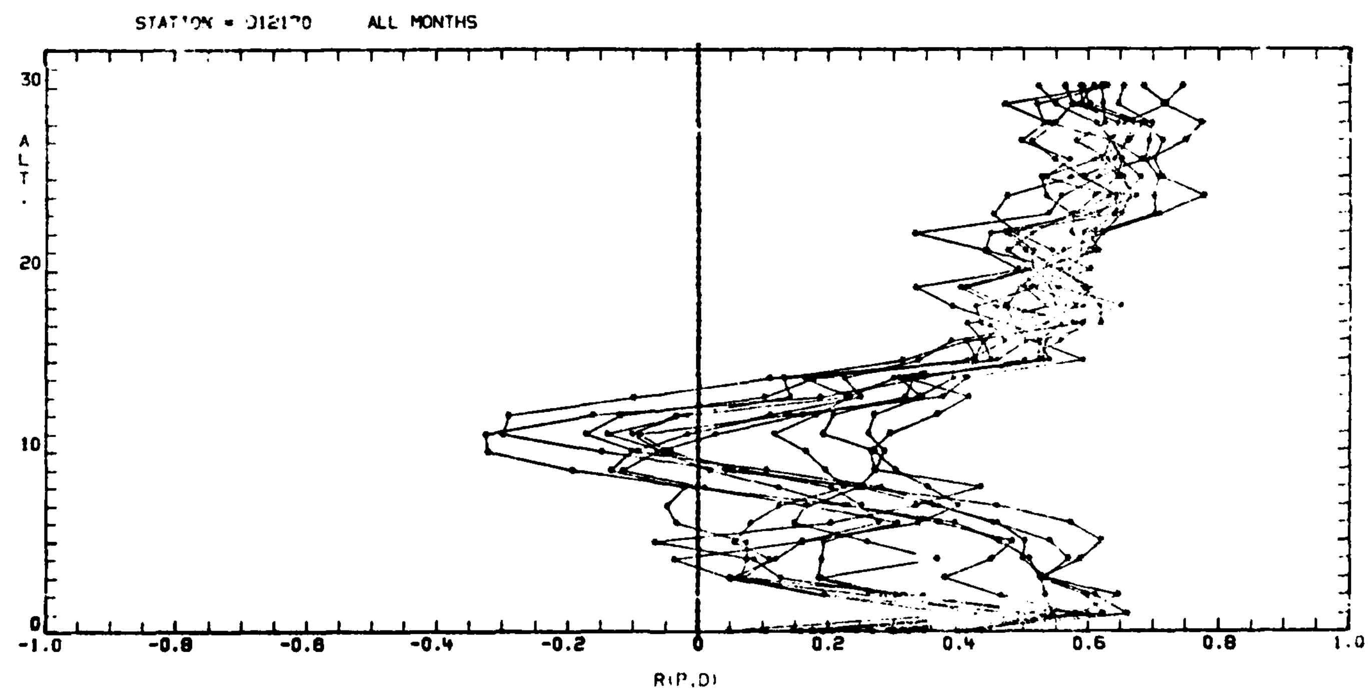


Fig. B-20.

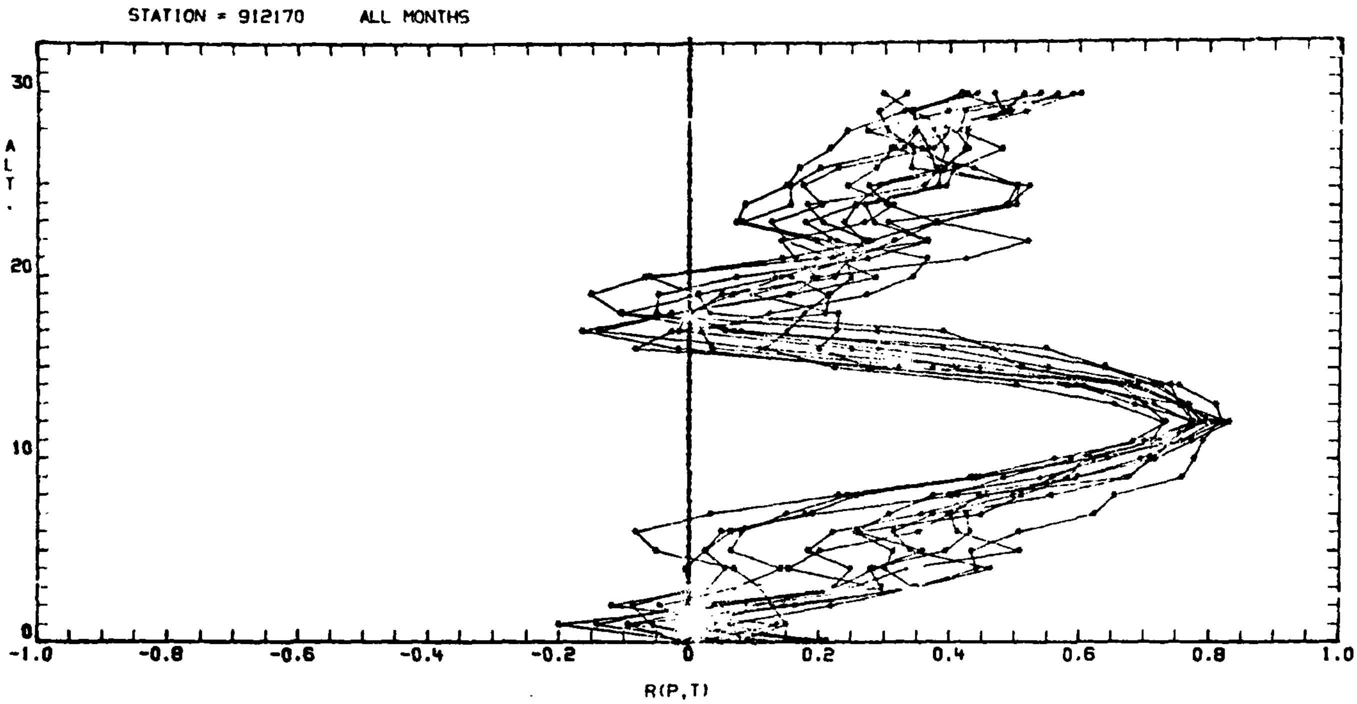


Fig. B-21.

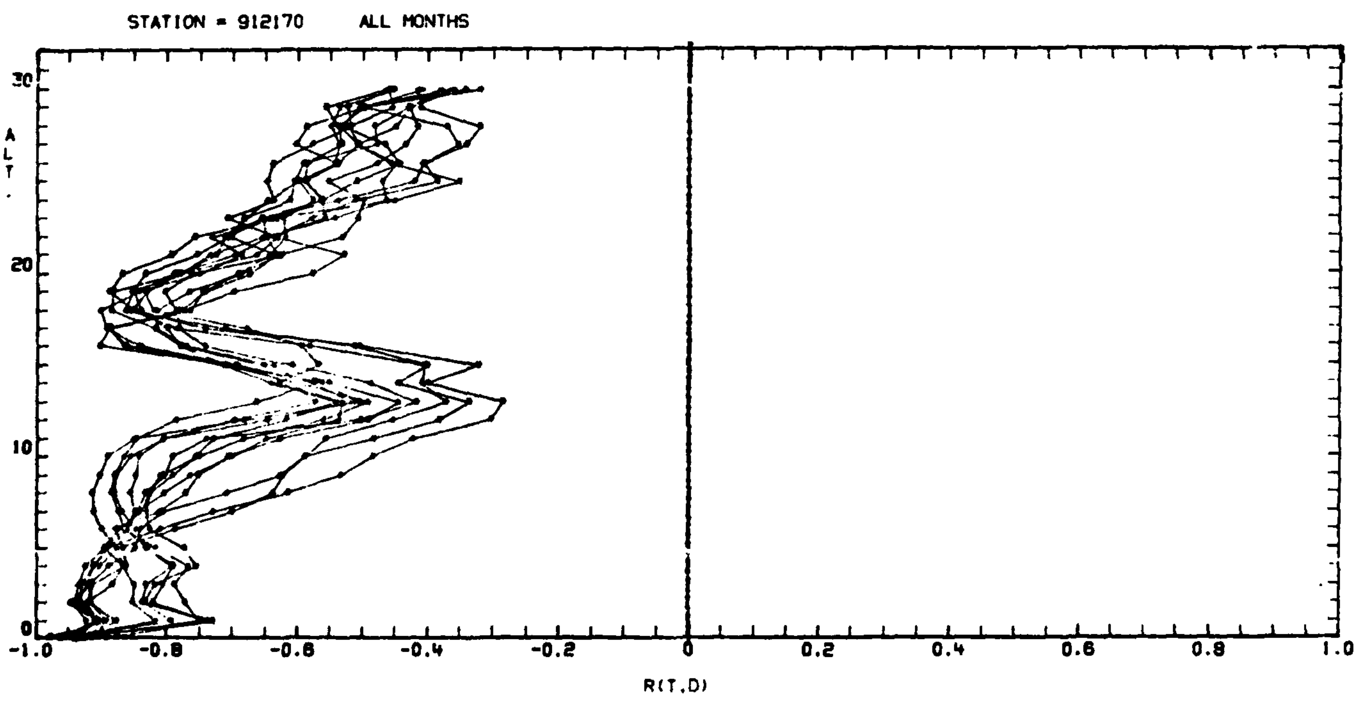


Fig. B-22.